MEQB Site Permit Application for a Large
Wind Energy Conversion System

Trimont Wind Project
Jackson and Martin Counties, Minnesota

Prepared for:

Trimont Wind I, LLC

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Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
ADT	Average Daily Traffic
ANSI	American National Standards Institute
bgs	Below Ground Surface
BMP	Best Management Practices
BP	Before Present
CON	Certificate of Need
CRP	Conservation Reserve Program
CSAH	County State Aid Highway
dBA	Decibels
DNR	Minnesota Department of Natural Resources
DOE	Department of Energy
ELF-EMF	Extremely Low Frequency – Electric and Magnetic Field
EPC	Engineering Procurement Construction
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
ft	Feet
ft^2	Square Feet
gpm	Gallons per Minute
GRE	Great River Energy
Hz	Hertz
kV	Kilovolt
kVA	Kilovolt ampere
kW	Kilowatt
LWECS	Large Wind Energy Conversion System
m	Meter
m/s	Meters per second
m^2	Square Meters
MDH	Minnesota Department of Health
MEQB	Minnesota Environmental Quality Board
MISO	Midwest Independent Transmission System Operator
MPCA	Minnesota Pollution Control Agency
mph	Miles per hour
MW	Megawatt
MWh	Megawatt hour
NHD	Natural Heritage Database
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Program
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
O & M	Operations and Management
PCB	Polychlorinated Biphenyls
PLC	Programmable Logic Controller
PPA	Power Purchase Agreement
PRC	Programmable Logic Controller
PUC	Public Utilities Commission
PWI	Public Waters and Wetlands Inventory
RD	Rotor Diameter
RFP	Request for Proposal
RIM	Reinvest in Minnesota

rpm	Revolutions per Minute
SCADA	Supervisory Control and Data Acquisition System
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SRE	Split Rock Energy
SWPPP	Storm Water Pollution Prevention Plan
T&E	Threatened and Endangered
TCP	Traditional Cultural Property
TI	Turbulence Intensity
USFWS	United States Fish and Wildlife Service
WMA	Wildlife Management Area
WRAP	Wind Resource Analysis Program
WTG	Wind Turbine Generators

1.0 INTRODUCTION

Trimont Wind I, LLC (Trimont Wind I) submits this application for a Site Permit to construct a large wind energy conversion system (LWECS), the Trimont Wind Project (the Project), as defined in the Wind Siting Act, Minnesota Stat. §116C.691. The Project is located in Jackson and Martin Counties, Minnesota (Figure 1) and will be approximately 100 megawatts (MW) in size, consisting of as many as 67 1.5 MW wind turbine generators (WTG).

Trimont Wind I is an unregulated wholly owned affiliate of PPM Energy (PPM), which develops environmentally responsible electric generation projects in the Western and Midwestern United States. PPM owns and operates or markets the output for over 800 MW of renewable energy generation capacity. There are two wind projects in the vicinity of the Trimont Wind Project: the 51 MW Moraine Wind LWECS located in Pipestone and Murray Counties, Minnesota and the Flying Cloud Wind Project in Dickinson County, Iowa. In addition, PPM owns gas storage and gas-fired generation facilities in the Western United States. Trimont Wind I is headquartered in Portland, Oregon.

The Project was selected by Great River Energy (GRE) through a competitive bidding process administered for GRE by Split Rock Energy (SRE). Trimont Area Wind Farm, LLC, was the successful bidder to SRE's Request for Proposals for Renewable Energy Supply Resources. GRE's objective is to add a significant and competitively priced wind resource to its renewable energy portfolio in an effort to meet Minnesota's Renewable Energy Objective (REO) (see Minnesota Statutes Section 216B.1691).

Trimont Area Wind Farm, LLC consists of more than 40 local farmer and landowner members currently owning land covering thirty-five square miles straddling the Martin-Jackson county line. Trimont Area Wind Farm, LLC's owners are members of South Central Electric Association, a member-owner of GRE. In order to develop the Project for GRE's needs in a timely, efficient, and cost-effective manner, Trimont Area Wind Farm, LLC has entered into a business relationship with PPM. Trimont Area Wind Farm, LLC's owners will not only receive the traditional lease payments for turbine siting but will also own an interest in the Project's gross revenues through a revenue participation interest deed. Trimont Wind I will design, construct, finance, operate, and maintain the Project.

Consistent with the Minnesota Environmental Quality Board's (MEQB) LWECS siting objectives (Minnesota Statute 116C.693), Trimont Wind I is committed to optimizing the wind resource for the Project. All decisions with respect to equipment selection, site layout, and spacing will be designed to make the most efficient use of land and wind resources. The factors on which these decisions are based include unique topographic features, available technology, and the nature of prevailing wind resources.

1.1 PROJECT SUMMARY

1.1.1 PROPOSED SITE

The Project is located in Martin County within Cedar Township (Township 104 N, Range 33 W, Sections 7-9, 16-21, 28-30); and in Jackson County within Kimball Township (Township 104 N, Range 34 W, Sections 8-17, 20-29, 34-36). The Project site is approximately 22,400 acres located approximately six miles west of the city of Trimont. The turbines will be placed throughout the Project site. The Project's location and preliminary site layout is shown in Figures 2 and 3. See Section 5.0 for a description of the Project site.

1.1.2 PROJECTED OUTPUT

The Project will have a nameplate capacity of approximately 100 MW. Assuming net capacity factors of approximately 39 percent, projected average annual output will be approximately 342,000 MWh. As with all wind projects, output will be dependent on final design, site-specific features, and equipment.

1.1.3 SITING PLAN

The turbines and associated facilities will be sited on agricultural land in Jackson and Martin Counties, Minnesota. Trimont Wind I will prepare the final siting layout to optimize wind and land resources at the site, while minimizing Project impacts. The topography of the site and the selected turbine technology will dictate turbine spacing. The Project will have, on average, east-west spacing between individual turbines of 3 rotor diameters (RD) and north-south spacing of 6 RD. A description of turbine technology is presented in Section 4.2.

Trimont Wind I will use equipment with a rotor diameter of 70 to 82 meters. The average north-south turbine spacing would be 492 meters (1,614 feet) (6 RD x 82 m) and, assuming a 5 RD perimeter setback, would be as much as 410 meters (1,345 feet) (5 RD x 82 m diameter) from the Project boundaries. The perimeter setback is approximately a quarter mile. Previous MEQB LWECS Site Permit requirements identify minimum setbacks from residences of 500 feet and setbacks from public or developed roads of 250 feet. A 345kV transmission line and a natural gas pipeline cross the site of the proposed wind Project. The required setback from the 345 kV transmission line is approximately 121 meters (397 feet). The Northern Border Natural Gas Pipeline easement is 75 feet wide and the setback distance from the pipeline will be 38 feet (11.6 meters), which will be outside the pipeline ROW.

1.1.4 OPERATION AND MAINTENANCE

The Project is anticipated to be operational as early as end of year 2004. However, subject to permit approvals and the status of production tax credit legislation, the Project may come on line as late as December 31, 2005. Trimont Wind I will be responsible for the operation and maintenance of the wind farm for the life of the Project, which is anticipated to be a minimum of 20 years. Trimont Wind I will contract with the most appropriate supplier of operations and maintenance (O&M) services at the time of operation. An O&M facility will be built as a part of the Project and current plans are to locate the facility near the existing Martin County substation.

1.1.5 SITE CONTROL

Trimont Wind I has site control of land sufficient to support a 100 MW project.

1.1.6 PERMITS AND LICENSES

Trimont Wind I will obtain all permits and approvals that are necessary and not covered by the MEQB Site Permit. Permits and approvals for the Project are identified in Section 6.0.

1.1.7 DEVELOPMENT AND CONSTRUCTION

Trimont Wind I and an Engineering Procurement Construction (EPC) contractor, to be determined, will perform or manage all development and installation activities. Specifically, Trimont Wind I will:

- perform site resource analysis and micrositing analysis;
- undertake environmental review; and
- obtain specific permits and licenses for the Project.

The EPC Contractor will:

- perform civil engineering for erection and installation of the Project;
- construct foundations, towers, and transformers;
- assemble and install wind turbines;
- install the communication system, including supervisory control and data acquisition software and hardware and telephone or fiber-optic cable; and construct the electrical feeder and collection system.

1.2 COMPLIANCE WITH THE WIND SITING ACT AND MINNESOTA RULES 4401

The Wind Siting Act requires an application for a site permit for a LWECS to meet the substantive criteria set forth in Minn. Stat. §116C.57, subp. 4. This application provides information necessary to demonstrate compliance with these criteria and the Minnesota Rules Chapter 4401. The siting of LWECS is to be made in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources (Minn. Stat. §116C.693).

On February 7, 2002, the MEQB adopted Wind Siting Rules (Minnesota Rules Chapter 4401) that implement the permitting requirements for LWECS. The rules govern the contents and treatment of applications for site permits under the Wind Siting Act. To the extent available, Trimont Wind I has presented information required by the Wind Siting Rules. In addition, sufficient Project design, wind resource, and technical information have been provided for a thorough evaluation of the reasonableness of the proposed site as a location for the Project.

1.2.1 CERTIFICATE OF NEED

Under Minnesota Rules Chapter 4401.0450, subp. 2, a Certificate of Need (CON) is required from the Minnesota PUC for the Trimont Wind Project. The CON was submitted on November 18, 2003 and a supplement to the CON was filed on January 12, 2004. Approval is anticipated in July 2004.

1.2.2 STATE POLICY

Trimont Wind I will further the state policy (Minnesota Statute 116C.693) by siting the Project in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources. In addition, the Project's utilization of existing high voltage transmission lines is consistent with the State of Minnesota's commitment to non-proliferation of transmission corridors.

1.3 PROJECT OWNERSHIP

Trimont Wind I will own the Project, subject to the participation rights vested in Trimont Area Wind Farm, LLC. Trimont Wind I will likely select a third-party EPC contractor to perform all engineering, procurement, and construction of the wind farm.

It is anticipated that Trimont Wind I will construct and own all equipment up to the high side of the 345kV busbar at the Project substation.

The interconnection study has commenced on the Midwest Independent Transmission System Operator (MISO) interconnection queue position associated with this Project. An interconnection agreement is anticipated first quarter 2004. The interconnection agreement will be provided to the MEQB when available.

2.0 GENERAL DESCRIPTION OF THE PROPOSED FACILITY

2.1 WIND POWER TECHNOLOGY

As the wind passes over the blades of a wind turbine, it creates lift and causes the rotor to turn. The rotor is connected by a hub and main shaft to a system of gears, which are connected to a generator. Exact turbine models are subject to change to ensure selection of a turbine that is both cost effective and optimizes land and wind resources. Currently, Trimont Wind I anticipates using 67 1.5 MW GE turbines. The GE Wind Energy 1.5 MW utility-grade wind turbine has a nominal nameplate rating of 1,500 kW. Each turbine is equipped with a wind speed and direction sensor that communicates to the turbine's control system to signal when sufficient winds are present for operation. The GE 1.5 MW wind turbine features variable-speed control and independent blade pitch to assure aerodynamic efficiency. The GE 1.5 MW turbine begins operation in wind speeds of 3 m/s (6.7 mph) and reaches its rated capacity (1.5 MW) at a wind speed of 11.8 m/s (26.4 mph). The turbine is designed to operate in wind speeds of up to 25 m/s (45 mph) and can withstand sustained wind speeds of over 45 m/s (100 mph).

The electricity generated by each turbine is brought to a pad-mounted transformer where the voltage is raised (stepped up) to distribution line voltage of 34.5 kV. The electricity is collected by a system of underground cables within the wind site. Typically, the underground cable is run along the access roads and interconnected to a project feeder system at the public road right-of-way. The feeder system distributes power to the utility point of interconnection. At the point of interconnection, the power is transformed to transmission level voltage and transmitted to system load and customers via the utility's transmission and distribution system. The Project substation will conform to MISO standards and will be owned by Trimont Wind I.

2.2 PHYSICAL DESCRIPTION

The Project will consist of up to 67 1.5 MW GE turbines. Each turbine will have an 80-meter (262 ft) hub height and 70 to 82 meter (231 to 269 ft) rotor diameter (Figure 4). Each tower will be secured by a concrete foundation that can vary in design depending on the soil conditions. A control panel inside the base of each turbine tower houses communication and electronic circuitry.

A step-up transformer will be installed at the base of each turbine to raise the voltage to distribution line voltage (34.5 kV). Both power and communication cables will be buried in trenches on private property or public right-of-way. Typically, this infrastructure is run adjacent to the project access roads. In cases where such infrastructure must be sited on property that is not governed by the existing wind easement and land lease options, Trimont Wind I will obtain transmission easements for the necessary property. Each wind turbine will be accessible via all-weather Class 5 gravel roads providing access to the turbines via public road. At the point where the access and public roads meet, the communication and power lines will either rise from underground to overhead lines or continue as underground feeder lines. Figure 5 is a diagram of the path of energy from the wind farm to energy users. Figure 6 shows a typical wind farm facility layout.

2.3 WIND FARM PROJECT LAYOUT

Trimont Wind I will develop a site layout that optimizes wind resources while minimizing the impact on land resources and any potentially sensitive areas.

Wind-powered electric generation is entirely dependent on the availability of the wind resource at a specific location. The energy available from the wind increases at the third power of the wind speed. In other words, a doubling of the wind speed will increase the available energy by a factor of eight times. Analysis of wind direction data suggests that the optimal turbine string alignments are from west to east and from west-northwest to east-southeast. Turbine placement was designed to provide a minimum of 3 RD crosswind spacing and a minimum of 6 RD downwind spacing between turbines pending further analysis of the wind resources.

Trimont Wind I will incorporate setbacks of at least 500 feet or sufficient distance to meet MPCA noise standards from inhabited (not vacant or abandoned) residences and 250 feet from the centerline of public roads. Trimont Wind I will have minimum setbacks of 397 feet from the 345 kV transmission line and 38 feet from the Northern Border Natural Gas Pipeline. Where a site boundary is adjacent to land with developable wind resource, Trimont Wind I will comply with the 5 RD (1,150 to 1,345 ft) setback requirement. However, Trimont Wind I proposes a less than a 5 RD setback to the project site boundary when the land adjacent to the site boundary has no developable wind resource (e.g., wetlands and protected areas). These special setback areas would be reviewed by Trimont Wind I and the MEQB on a "case-by-case" basis.

2.4 ASSOCIATED FACILITIES

In addition to the wind turbines and the step-up transformers, the Project will include several miles of gravel access roads that allow for easy access to the wind turbines year-round. These roads will be approximately 4.9 meters (16 feet) wide and low profile to allow cross-travel by farm equipment. Trimont Wind I will work closely with the landowners in locating access roads to minimize land use disruptions to the extent possible. Consideration will be taken in locating access roads to minimize impact on current or future row crop agriculture and other environmentally sensitive areas.

Additionally, Trimont Wind I will likely construct a single permanent tower to house an anemometer. Tower specifications will be determined through discussions with GRE, in conjunction with local requirements. The tower will be lighted to comply with Federal Aviation Administration (FAA) requirements and United States Fish and Wildlife Service (USFWS) guidelines. An O&M facility will be constructed adjacent to the GRE facility pending the interconnection study and the location of the Project substation. Please see Section 4.5.4 for a description of this facility.

2.5 LAND RIGHTS

Trimont Wind I has obtained wind rights and easements for a 100 MW project. Land rights will encompass the proposed wind farm and all associated facilities, including but not limited to wind and buffer easements, wind turbines, access, transmission feeder lines located on public roads when necessary, and possibly land to mitigate environmental impacts incurred due to development.

3.0 PROPOSED SITE

3.1 IDENTIFICATION OF PROJECT SITE

In addition to wind resource considerations, the Project site was selected based on its close proximity to existing transmission infrastructure, a substation, and a gas peaking facility; the ability to have landowner issues controlled by a coordinated effort; the ability to expand as required; and additional considerations necessary to allow 100 MW of wind power to be generated from the site. Land-use patterns and environmentally sensitive features were factored into the site selection criteria, in identifying the project boundaries, to provide sufficient land area for turbine location. The site boundary encompasses an area of approximately 22,400 acres. However, the land occupied by the wind farm would be less than 1% of this area assuming up to 67 turbines and access roads. It is anticipated that the area of direct land use for the turbines and associated facilities would be approximately 40 acres and this would include approximately 14 miles of 16-foot wide gravel access roads. See Section 5.0 for a detailed description of the Project and Site impacts. Figure 3 shows preliminary turbine locations, which are subject to change during micrositing.

3.2 WIND RESOURCE AREAS – GENERAL

The United States Department of Energy (DOE) and the Minnesota Department of Commerce (MDOC) have conducted wind resource assessment studies in Minnesota since 1982. In October 2002, the MDOC published the latest "Wind Resource Analysis Program" (WRAP) report that presents wind analysis data from monitoring stations across the state of Minnesota. In the vicinity of the project area, the mean annual wind speed at an elevation of 50 m (164 ft) is mapped as 6.81 to 7.17 m/s (15.2 to 16.0 mph). At an elevation of 70 m (230 ft) above ground level, mean annual wind speed is mapped as 7.17 to 7.51 m/s (16.0 to 16.8 mph).

Trimont Wind I has reviewed and analyzed meteorological information for the Jackson-Martin County area and the Project site. This information is described below in Section 3.3.

3.3 WIND CHARACTERISTICS IN PROJECT AREA

Trimont Wind I has one meteorological tower in the project area located in Section 27, Township 104 N, Range 34 W that has been collecting data since July 23, 2003. To supplement the data from the project site, eight years of historical data from the Minnesota Department of Commerce meteorological site in Brewster, located approximately 23 miles west of the project area, were correlated with the wind data from the Project site to provide a more robust data set. The Brewster meteorological tower is at an elevation of 1,400 feet and the meteorological tower at the Project site is at an elevation of 1,370 feet. WindPRO and WAsP software were used to analyze the available wind data from the Brewster meteorological tower and make corrections for the site effects (topography, surface roughness and obstacles) to produce a site-independent characterization of the local wind climate. The resulting local wind climate was applied in conjunction with the project area site effects to predict the spatial wind variations at the project site. Various site layouts and wind turbine generator parameters can be tested to predict the energy production and array efficiency to optimize the site layout and turbine selection. Project site data has been compared to the long term Brewster data and other regional wind measurements using a parallel time period. There is a good correlation between the long-term wind measurements and the short-term project site wind measurements. Based on the available data, the Brewster and Trimont sites can be judged as having similar wind climates.

3.3.1 Interannual Variation

Based on adjusted data from the Department of Commerce's Brewster site, the estimated average annual wind speed at the Project site from 1995 to 2003 was 7.7 m/s (17.2 mph), with a range of 7.1 to 8.0 m/s (15.9 to 17.9 mph), or a variation of approximately twelve percent.

3.3.2 Seasonal Variation

The expected wind speed in the Project area at 80 meters is shown in Table 3.1. The strongest winds are during the months of February through April and October through December when average wind speeds range from 8.0 to 8.5 m/s (17.9 to 19.0 mph). The summer months of July and August have the lowest average wind speeds of 6.3 and 6.0 m/s (14.1 and 13.4 mph), respectively.

Table 3.1
Estimated Wind Speed at 80 meters in Project Area (m/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1995							6.5	6.0	7.0	8.5	8.4	7.4	7.3
1996	7.7	9.3	8.5	8.4	7.8	7.0	6.1	6.0	6.7	9.2	7.5	7.8	7.7
1997	9.0	8.1	8.9	7.8	8.9	7.0	6.9	5.3	7.1	9.1	7.4	7.0	7.7
1998	5.7	6.5	7.8	8.0	8.0	6.8	5.1	5.7	6.8	7.9	8.4	8.3	7.1
1999	7.3	8.8	8.2	8.8	8.5	7.6	6.8	6.6	7.8	8.5	8.3	8.1	7.9
2000	7.8	8.1	7.5	8.2	7.8	8.0	5.7	6.2	7.5	7.5	8.5	8.0	7.6
2001	8.2	7.5	7.2	8.8	7.8	7.8	6.0	6.0	6.3	9.0	9.2	8.9	7.7
2002	8.4	10	7.1	9.3	8.6	8.4	6.5	6.7	7.4	6.8	7.9	8.4	8.0
2003	7.7	8.7	8.5	8.4	7.7	6.6	6.8	5.7	7.8	7.9	9.2	9.3	7.6
Mean of the means	7.7	8.4	8.0	8.5	8.1	7.4	6.3	6.0	7.1	8.3	8.2	8.0	7.7

3.3.3 DIURNAL CONDITIONS

Figure 7 shows the expected diurnal variations of wind speeds. Wind speeds are generally greatest during nighttime and early morning hours and decline at midday.

3.3.4 ATMOSPHERIC STABILITY

The atmospheric stability is defined by lateral fluctuation of the wind, or sigma theta. Stability level is characterized by sigma theta 0 to 2.5 degrees as stable, 2.5 to 7 as moderately stable, 7 to 9 as neutral, 9 to 15 as moderately unstable, and greater than 15 degrees as very unstable (these categories are from *Meteorology and Atomic Energy*, Slade D.H., 1968). The atmospheric stability based on the Department of Commerce's Brewster site at the 70-meter (230 feet) level is moderately stable at 6.8 degrees. The stability level frequency is shown in Table 3.2.

Table 3.2
Frequency of Stability Class

Stability Level	Frequency
Stable	10%
Moderately Stable	59%
Neutral	16%
Moderately Unstable	11%
Unstable	4%

3.3.5 HUB HEIGHT TURBULENCE

The Turbulence Intensity (TI) is defined as the measured standard deviation of wind speed over an hour, divided by the mean for the same time period. For wind speeds greater than 5 m/s the expected TI is 11.3%. For wind speeds greater than 15 m/s, the expected TI is 10.98%.

3.3.6 EXTREME WIND CONDITIONS

The maximum hourly wind speed measured at the Department of Commerce's Brewster tower from July 1995 through October 2003 was 25 m/s (56 mph). Using a conservative gust factor of 1.3, the expected highest one-second gust would have been 33 m/s (74 mph).

Extreme temperature range is expected be between 104 and -31 degrees Fahrenheit (°F). Glaze icing may occur up to 2% of the operating hours of the year for wind turbines.

3.3.7 WIND SPEED FREQUENCY DISTRIBUTION

Figure 8 presents a wind speed frequency distribution for the Project area. Wind speeds range between 4 and 11 m/s (9 and 25 mph) approximately 75 percent of the time, and between 6 and 10 m/s (13 and 22 mph) approximately 50 percent of the time.

3.3.8 WIND VARIATION WITH HEIGHT

Wind shear is the relative change in wind speed as a function of height. Wind shear is calculated using a power function based upon the relative distance from the ground. The general equation used for calculating wind shear is $S/S_0 = (H/H_0)^{\alpha}$, where S_0 and H_0 are the speed and height of the lower level and α is the power coefficient. The power coefficient can vary greatly due to the terrain roughness and atmospheric stability. The power coefficient will also change slightly with variation in height. The vertical variation with height or shear coefficient is 0.278 based on the 50 to 70 meter (164 to 230 feet) level at Department of Commerce's Brewster site.

3.3.9 SPATIAL WIND VARIATION

A map of the spatial variation of the wind for the Project area was prepared using a regional wind statistic generated from the Minnesota Department of Commerce's Brewster wind data. The model used to develop the map takes into account wind data, topography and surface roughness characteristics. The map shows that well-exposed terrain in the Project area is in the 7.6 to 7.8 m/s (17.0 to 17.4 mph) range of wind speeds at 80 meters (230 feet).

Little variation is expected across the project area, because of the relatively flat, open terrain. Wind speeds should be quite similar at all the tower sites proposed for this Project.

3.3.10 WIND ROSE

A wind rose is a graphical presentation that shows the various compass points, and specifies the frequency that the wind is observed to blow from a given compass point. Small-scale variations are expected at the proposed site depending on individual turbine height and exposure. Figure 9 shows the expected wind rose for the Project area generated from the Department of Commerce's Brewster site. The wind rose shows the characteristic signature of Midwestern sites, in that winds blow from many directions rather than a single prevailing direction. The wind rose shows a preference for winds from the south and northwest.

3.4 OTHER METEOROLOGICAL CONDITIONS

3.4.1 AVERAGE AND EXTREME WEATHER CONDITIONS

The Project area has a subhumid, continental climate that is characterized by cold winters and hot summers. Summers provide long periods of sunshine, and southerly winds bring warm, moist air from the Gulf of Mexico. In winter, the climate cools rapidly because solar insulation is reduced and northerly winds bring in cold, dry air from high latitudes. The climate of the project area is quite uniform because there are no large bodies of water or sharply marked differences in topography within the area.

There are no existing long-term data available specifically for the project site; however, the data from Windom, Minnesota, located approximately eight miles to the northwest, should be representative of the site. Table 3.3 provides data on temperature and precipitation for the study area, as recorded at Windom, Minnesota during the period 1971 to 2000. This period is assumed to be representative of the climate for the study area. In the winter (December to February), the average maximum temperature is 30 °F, and the average minimum temperature is 12 °F. The lowest temperature recorded at Windom, Minnesota during the representative period is -36 °F, which occurred on January 7, 1988. In the summer (June to August), the average maximum temperature is 81 °F. The highest temperature recorded at Windom, Minnesota during the representative period is 105 °F, which occurred on August 1, 1988. The total annual precipitation is about 29 inches. The greatest one-day rainfall recorded at Windom, Minnesota during the representative period is 5.24 inches, which occurred on August 10, 1994. The average seasonal snowfall is 43.6 inches.

The National Climatic Data Center (NCDC) has records of 174 extreme weather events for Jackson County and 218 extreme weather events for Martin County for the period from January 1, 1950 to June 30, 2003. These events include thunderstorms, tornadoes, hail, heavy snow and ice, extreme cold, heat waves, and drought. Tornadoes and severe thunderstorms strike occasionally. The state of Minnesota sees approximately 15 to 20 tornadoes a year. The NCDC has records of 60 thunderstorms and high wind events in Jackson County, and 86 thunderstorms and high wind events in Martin County, for the period January 1, 1950 to June 30, 2003. These storms are local in extent and of short duration. They result in damage to small geographic areas. Hail occasionally falls in scattered areas during the warmer periods.

Neither hail nor lightning from severe storms presents a problem for operation of the proposed development. Wind turbines, however, are not designed to survive tornado-force winds of 89+ m/s (200+ mph). In the winter, icing events are variable in frequency. It is expected that the average annual energy loss will be 2 percent due to icing.

Table 3.3
Temperature and Precipitation
(Recorded in the Period 1971-2000 at Windom, Minnesota)

Month	Temperature			Precipitation	
	Average Daily Maximum °F	Average Daily Minimum °F	Average °F	Average In	Average Snowfall In
January	21.7	3.8	12.8	0.79	9.2
February	28.5	10.5	19.5	0.64	6.2
March	40.1	22.5	31.3	2.06	8.8
April	55.7	33.8	44.8	2.88	3.1
May	70.2	46.0	58.1	3.58	0.0
June	79.6	56.1	67.9	4.47	0.0
July	83.2	60.6	71.9	3.88	0.0
August	80.5	57.9	69.2	3.46	0.0
September	72.1	48.2	60.2	2.60	0.0
October	59.4	36.2	47.8	2.08	0.8
November	39.7	22.5	31.1	1.80	7.4
December	25.7	9.4	17.6	0.76	8.1
Yearly					
Average	54.7	34.0	44.4		
Total				29.00	43.6

Source: Midwest Regional Climate Center, November 2003.

3.5 ENERGY PROJECTIONS

3.5.1 PROPOSED ARRAY SPACING FOR WIND TURBINES

Wind turbines will be placed along higher elevation features at the site to provide maximum exposure to wind resources. The proposed array spacing for the 1.5 MW turbines at the Project is a minimum of 3 RD in an east-west direction (crosswind spacing) and a minimum of 6 RD in a north-south direction (downwind spacing). The spacing is dependent upon the selected equipment and the topography of the site. Trimont Wind I will develop the site to minimize array wake losses and to optimize efficient use of wind and land resources.

3.5.2 BASE ENERGY PROJECTIONS

The Project will have a nameplate capacity of approximately 100 MW. Assuming net capacity factors of approximately 39 percent, projected average annual output will be approximately 342,000 MWh. As with all wind projects, output will be dependent on final design, site-specific features, and equipment. Gross to net calculations take into account, among other factors, energy losses in the gathering system, mechanical availability, array losses, and system losses. An industry-wide estimate of energy losses ranges from 8 to 10 percent of maximum output.

3.6 COST ANALYSIS

Trimont Wind I has estimated costs using typical wind farm design, construction and operation data to be approximately $1,200/kW, pending final interconnection costs. For purposes of comparison, a service life of 30 years has been assumed in order to estimate annualized capital costs. The actual price that the Project will obtain from the sale of its energy and environmental attributes to GRE is proprietary and confidential.

4.0 ENGINEERING AND OPERATIONAL DESIGN ANALYSIS

This section provides a summary description of the Project, which includes a description of the project layout, turbines, electrical system, and associated facilities. Additional information addressed in this section is project construction, schedule, operation, and decommissioning of the site. Trimont Wind I is proposing using GE 1.5 MW turbines, however Trimont Wind I wishes to preserve the right to evaluate and select turbine equipment of varying sizes and outputs. Turbine supply may affect the number and configuration of the turbine array.

4.1 TRIMONT WIND I PROJECT LAYOUT AND ASSOCIATED FACILITIES

The Project will consist of an array of wind turbines, transformers, roads, and crane pads. The turbines will be interconnected by communication and electric power collection cable within the wind farm. In addition, the wind farm facilities will include feeder lines, typically placed within the public right-of-way, that deliver the electricity to a substation for interconnection into Xcel Energy's transmission system.

Land will be graded on-site for the turbine pads. Drainage systems, access roads, storage areas, and shop facilities will be installed as necessary to fully accommodate all aspects of Project construction, operation, and maintenance.

The electrical system design and interconnection details will be determined as a result of studies and discussions with GRE, Xcel Energy, and MISO. The feeder system will deliver the power to Xcel Energy's Martin County Substation. At the Project substation, adjacent to the Martin County substation, the electric voltage will be stepped up to transmission level voltage, which is expected to be 345 kV.

The Project includes a computer-controlled communications system that permits automatic, independent operation, and remote supervision, thus allowing the simultaneous control of many wind turbines. Trimont Wind I will be responsible for Project operation and maintenance for the life of the project. Trimont Wind I will contract with the most appropriate supplier of operations and maintenance services at the time of operation, to assure timely and efficient operations. Trimont Wind I will maintain a computer program and database for tracking each wind turbine's operational history.

4.2 DESCRIPTION OF WIND TURBINES

Trimont Wind I anticipates using up to 67 1.5 MW GE turbines, but requires the flexibility to select the most appropriate technology at the time for the Project to ensure optimization of wind and land resources and cost efficiency. The preliminary site layout is based on 1.5 MW wind turbine generators. Trimont Wind I will update the site layout, consistent with the parameters laid out in the Site Permit, when equipment is selected and if information regarding the wind resource identifies opportunities to further optimize the site.

4.2.1 TURBINE

GE 1.5 MW wind turbines are anticipated for use at the Trimont Wind Project. The GE 1.5 MW turbine begins operation in wind speeds of 3 m/s (6.7 mph) and reaches its rated capacity (1.5 MW) at a wind speed of 11.8 m/s (26.4 mph). The turbine is designed to operate in wind speeds of up to 25 m/s (45 mph) and can withstand sustained wind speeds of over 45 m/s (100 mph).

The 1.5 MW turbine has active yaw and pitch regulation with power torque control capacity and an asynchronous generator. The turbine uses a bedplate drive train design where all nacelle components are joined on common structures to improve durability.

GE Wind Energy has incorporated the Supervisory Control and Data Acquisitions (SCADA) communication technology into their turbines. SCADA communications system permits automatic, independent operation and remote supervision, thus allowing the simultaneous control of many wind turbines. Operations, maintenance and service arrangements between GE and Trimont Wind I will be structured so as to provide for timely and efficient operations. The computerized data network will provide detailed operating and performance information for each wind turbine. Trimont Wind I will maintain a computer program and database for tracking each wind turbine's operational history.

Other specifications of the GE 1.5 MW turbine include:

- Active blade pitch power control.
- Control system with Programmable Logic Controller (PLC) remote control and monitoring system.
- Gearbox with three-step planetary spur gear system.
- Double fed three-phase asynchronous generator.
- A fail-safe braking system that includes electromechanical pitch control for each blade (3 self contained systems) and a hydraulic parking brake.
- Yaw system is electromechanically driven with wind direction sensor and automatic cable unwind.

4.2.2 Rotor

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system and other electrical and mechanical systems. The preliminary design identifies a 70.5 m (231 feet) to an 82 m (269 feet) RD. The swept area for the 70.5 m RD would be 3,904 m^2 (42,022 ft^2), and the 82 m RD would be 5,281 m^2 (56,844 ft^2). The rotor speed would be 10.1 to 20.4 rpm.

4.2.3 Tower

The tower is a conical tubular steel tower with a hub height of 80 meters (262 feet). The turbine towers, on which the nacelle is mounted, consist of three to four sections manufactured from certified steel plates. All welds are made in automatically controlled power welding machines and ultrasonically inspected during manufacturing per ANSI specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower.

4.2.4 Lightning Protection

Each entire turbine is equipped with a lightning protection system. The turbine is grounded and shielded to protect against lightning. The grounding system will be installed during foundation work, and must be accommodated to local soil conditions. The resistance to neutral earth must be in accordance with local utility or code requirements. Lightning receptors are placed in each rotor blade and in the tower. The machine frame, crane-bar and crane-pillar are equal-potential bonded. The electrical components have surge protection.

4.3 DESCRIPTION OF ELECTRICAL SYSTEM

At the base of each turbine a step-up transformer will be installed to raise the voltage to distribution line voltage of 34.5 kV. Power will be run through an underground collection system to the project feeder system that will feed power to the point of interconnection. The electrical lines will be buried in trenches adjacent to the project access roads. At the point where the access and public roads meet, the power lines will either rise from underground to overhead lines or continue as underground lines. The feeder system will deliver the power from the wind farm to the wind farm substation. At the wind farm substation, the electric voltage will be stepped up to transmission level voltage, which is expected to be 345 kV. The power will then be transmitted to Xcel Energy’s Martin County Substation, adjacent to GRE's Lakefield Junction Generating Station, where it will enter the grid.

An interconnection study for the Project is underway with MISO in coordination with GRE and Xcel Energy. The electrical system design and interconnection details will be determined as a result of studies and discussions with GRE, Xcel Energy, and MISO. No details on the design have been determined at this time.

All utility protection and metering equipment will meet Xcel Energy standards for parallel operations. The construction manager will work closely with Xcel Energy’s engineers to ensure that proper interconnection protection is established. Detailed interconnection information will be supplied to the MEQB as it becomes available.

4.4 TRIMONT WIND FARM CONSTRUCTION

Several activities must be completed prior to the proposed Commercial Operation Date. The majority of the activity relates to equipment ordering lead-time, as well as design and construction of the facility. Below is a preliminary schedule of activities necessary to develop the Project. Pre-construction, construction, and post-construction activities for the Project include:

- ordering of all necessary components including towers, nacelles, blades, foundations, and transformers;
- final turbine micrositing;
- complete survey to establish locations of structures and roadways;
- soil borings, testing and analysis for proper foundation design and materials;
- complete construction of access roads, to be used for construction and maintenance;
- construction of overhead feeder lines;
- design and construction of Project substation;
- installation of tower foundations;
- installation of underground cables;
- tower placement and wind turbine setting;
- acceptance testing of facility; and
- commencement of commercial operation.

Access roads will be built adjacent to the towers, allowing access both during and after construction. The roads will be approximately 4.9 meters (16 feet) wide and have Class 5 gravel as cover, adequate to support the size and weight of maintenance vehicles. These roads will meet state and local requirements. The specific turbine placement will determine the amount of roadway that will be constructed for this project.

During the construction phase, several types of light, medium and heavy-duty construction vehicles will travel to and from the site, as well as private vehicles used by the construction personnel. Trimont Wind I estimates that there will be 25 trips per day in the area during peak construction periods. That volume will occur during the peak time when the majority of the foundation and tower assembly is taking place. At the completion of each construction phase this equipment will be removed from the site or reduced in number.

4.4.1 CONSTRUCTION MANAGEMENT

An EPC contractor will be primarily responsible for the construction management of the Project. The EPC contractor will use the services of local contractors, where possible, to assist in Project construction. The EPC contractor, in coordination with local contractors, will undertake the following activities:

- Securing building, electrical and grading permits
- Perform detailed civil, structural and electrical engineering
- Schedule execution of construction activities
- Complete surveying and geotechnical investigations

- Forecast Project labor requirements and budgeting

The EPC contractor also serves as key contact and interface for subcontractor coordination. The EPC contractor will oversee the installation of communication and power collection lines as well as the substation. The EPC contractor will also oversee the installation of roads, concrete foundations, towers, machines, and blades, as well as the coordination of materials receiving, inventory, and distribution.

The Project will be constructed under the direct supervision of on-site construction manager with the assistance of local contractors. The construction consists of the following tasks:

- Site development, including roads
- Foundation excavation
- Concrete foundations
- All electrical and communications installation
- Tower assembly and machine erection
- System testing

The construction team will be on site to handle materials purchasing, construction, and quality control. The EPC contractor will manage local subcontractors to complete all aspects of construction.

Throughout the construction phase, ongoing coordination occurs between the Project development and the construction teams. The on-site manager helps to coordinate all aspects of the Project, including ongoing communication with local officials, citizens groups and landowners. Even before the Project becomes fully operational, the O&M staff is integrated into the construction phase of the Project. The construction manager and the O&M staff manager work together continuously to ensure a smooth transition from construction through wind farm commissioning and, finally, operations.

4.4.2 FOUNDATION DESIGN

The 1.5 MW wind turbine's freestanding 80 meter (262 foot) tubular towers will be connected by anchor bolts to an underground concrete foundation. Geotechnical surveys, turbine tower load specifications and cost considerations will dictate final design parameters of the foundations. Foundations for similar sized turbines in Minnesota are approximately 40 to 50 feet across and 8 to 10 feet thick.

4.4.3 CIVIL WORKS

Completion of the Project will require various types of civil works and physical improvements to the land. These civil works include the following:

- Improvement of existing access roads to the project site
- Construction of roads adjacent to the wind turbine strings to allow construction and continued servicing of the wind turbines
- Clearing and grading for wind turbine tower foundation installations
- Trenching for underground cabling for connecting the individual wind turbines
- Installation of an on-site feeder system for connecting wind turbine strings for delivery to the electricity collection/metering location
- Clearing and grading for pad-mount transformers and other installations
- Installation of any site fencing and security

Any improvements to existing access roads will consist of re-grading and filling of the gravel surface to allow access even in inclement weather. No asphalt or other paving is anticipated. Access roads will be constructed along turbine strings or arrays. These roads will be sited in consultation with local landowners and completed in accordance with local building requirements and will be located to facilitate both construction (cranes) and continued operation and maintenance. Siting roads in areas with unstable soil will be avoided wherever possible. All roads will include appropriate drainage and culverts while still allowing for the crossing of farm equipment. The roads will be approximately 4.9 meters (16 feet) wide and will be covered with road base designed to allow passage under inclement weather conditions. The roads will consist of graded dirt, overlaid with fabric and covered with Class 5 gravel. Once construction is completed, the roads will be regraded, filled, and dressed as needed.

4.4.4 COMMISSIONING

The Project will be commissioned after completion of the construction phase. The Project will undergo detailed inspection and testing procedures. Inspection and testing occurs for each component of the wind turbines, as well as the communication system, meteorological system, high voltage collection and feeder system, and the SCADA system.

4.5 PROJECT OPERATION AND MAINTENANCE

Each wind turbine in the Project will communicate directly with the SCADA system for the purposes of performance monitoring, energy reporting and trouble-shooting. Under normal conditions each wind turbine operates autonomously, making its own control decisions.

Trimont Wind I will enter into contractual agreements with the most appropriate supplier to provide on-site service and maintenance for the Project.

4.5.1 Project Control, Management, and Service

Trimont Wind I and the appropriate supplier will control, monitor, operate, and maintain the Project by means of a SCADA computer software program. In addition to regularly scheduled on-site visits, the wind farm may be monitored via computer.

The SCADA system offers access to wind turbine generation or production data, availability, meteorological, and communications data, as well as alarms and communication error information. Performance data and parameters for each machine (generator speed, wind speed, power output, etc.) can also be viewed, and machine status can be changed. There is also a "snapshot" facility that collects frames of operating data to aid in diagnostics and troubleshooting of problems.

The primary functions of the SCADA system are to:

- monitor wind farm status,
- allow for autonomous turbine operation,
- alert operations personnel to wind farm conditions requiring resolution,
- provide a user/operator interface for controlling and monitoring wind turbines,
- collect meteorological performance data from turbines,
- monitor field communications,
- provide diagnostic capabilities of wind turbine performance for operators and maintenance personnel,
- collect wind turbine and wind farm material and labor resource information,
- provide information archive capabilities,
- provide inventory control capabilities, and
- provide information reporting on a regular basis.

4.5.2 Maintenance Schedule

Trimont Wind I will remotely monitor the Project on a daily basis. This will be accompanied by a visual inspection by a maintenance manager. Several daily checks will be made in the first three months of commercial operation to see that the Project is operating within expected parameters.

Once installed, the Project service and maintenance is carefully planned and divided into the following intervals:

A) First service inspection
B) Semi-annual service inspection

C) Annual service inspection
D) Two years service inspection
E) Five years service inspection

A) **First Service Inspection.** The first service inspection will take place one to three months after the turbines have been commissioned. At this inspection, particular attention is paid to the tightening up of all bolts by 100 percent, a full greasing, and filtering of gear oil.

B) **Semi-Annual Service Inspection.** Regular service inspections commence six months after the first inspection. The semi-annual inspection consists of lubrication and a safety test of the turbine.

C) **Annual Service Inspection.** The yearly service inspection consists of a semi-annual inspection plus a full component check. Bolts are checked with a torque wrench. The check covers 10 percent of every bolt assembly. If any bolts are found to be loose, all bolts in that assembly are tightened 100 percent and the event is logged.

D) **Two Years Service Inspection.** The two years service inspection consists of the annual inspection, plus checking and tightening of terminal connectors.

E) **Five Years Service Inspection.** The five years inspection consists of the annual inspection, an extensive inspection of the wind braking system, checking and testing of oil and grease, balance check, and tightness of terminal connectors.

4.5.3 General Maintenance Duties

The O&M field duties include the following:

- Perform all scheduled and unscheduled maintenance including periodic operational checks and tests, regular preventive maintenance on all turbines, related plant facilities and equipment, safety systems, controls, instruments, and machinery, including:
- Maintenance on the wind turbines and on the mechanical, electrical power, and communications system.
- Performance of all routine inspections.
- Maintenance of all oil levels and changing oil filters.
- Maintenance of the control systems, all Project structures, access roads, drainage systems and other facilities necessary for the operation.
- Maintenance of all O&M field maintenance manuals, service bulletins, revisions, and documentation for the Project.
- Maintenance of all parts, price lists, and computer software.
- Maintenance and operation of interconnection facilities.

- Provide all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm, including repairs and replacement of parts and removal of failed parts.
- Cooperate with avian and other wildlife studies as may be required to include reporting and monitoring.
- Manage lubricants, solvents, and other hazardous materials as required by local and/or state regulations.
- Maintain appropriate levels of spare parts in order to maintain equipment. Order and maintain spare parts inventory.
- Provide all necessary equipment including industrial cranes for removal and reinstallation of turbines.
- Hire, train, and supervise a work force necessary to meet the general maintenance requirements.
- Implement appropriate security methods.

4.5.4 Operations and Maintenance Facility

Trimont Wind I will enter into a contractual agreement with the most appropriate supplier of operations and maintenance services. The service and maintenance activities will be performed by qualified technicians who will report to an operations manager. The operations manager will be responsible for all management, administration, service and maintenance activities.

The location of the O&M facility at the Project will be located in close proximity to GRE's generating facility. Typically buildings used for this purpose are 2,000 square feet, which house all the necessary equipment to operate and maintain the Project.

4.6 PROJECT SCHEDULE

4.6.1 Land Acquisition

Trimont Wind I will be responsible for all land acquisition, and will obtain the necessary easements from landowners.

4.6.2 Permits

Trimont Wind I will be responsible for undertaking all required environmental review, and will obtain all permits and licenses that are required following issuance of the MEQB Site Permit.

4.6.3 EQUIPMENT PROCUREMENT, MANUFACTURE AND DELIVERY

Trimont Wind I will order the wind turbine components as soon as practicable. Once the turbines have been ordered, delivery is anticipated within six months.

4.6.4 CONSTRUCTION

The EPC contractor will be responsible for completing all Project construction, including roads, wind turbine assembly, electrical, and communications work. The construction will take approximately eight months to complete. Construction will likely commence in summer of 2004.

4.6.5 CONSTRUCTION FINANCING

Trimont Wind I will be responsible for financing all pre-development, development, and construction activities. Trimont Wind I anticipates financing the cost of all pre-development activities through internal funds or independent construction financing.

4.6.6 PERMANENT FINANCING

Trimont Wind I anticipates obtaining permanent financing from an institutional lender and equity investors prior to commercial operation of the Project.

4.6.7 EXPECTED COMMERCIAL OPERATION DATE

Trimont Wind I anticipates that the Project would begin operation as early as December 31, 2004, or as late as December 31, 2005, pending completion of permitting, power purchase agreements (PPA), PTC approval and other development activities.

4.7 DECOMMISSIONING AND RESTORATION

Trimont Wind I has a contractual obligation to the landowners to remove the Wind Facilities, including foundations, when the wind easement expires. Trimont Wind I also reserves the right to explore alternatives regarding Project decommissioning at the end of the Project Site Permit term. One such option may be to re-apply for a Site Permit and continue operation of the Project, providing energy under a new long-term contract or on a merchant basis. Retrofitting the turbines and power system with upgrades based on new technology may allow the wind farm to produce efficiently and successfully for many more years.

4.7.1 ESTIMATED DECOMMISSIONING COSTS IN CURRENT DOLLARS

Trimont Wind I will be responsible for all costs to decommission the Project and associated facilities. As a wholly owned affiliate of PPM energy, Trimont Wind I has the capacity to undertake decommissioning activities described in Section 4.7.2. Furthermore, under the agreement with the landowner, the Lessee must demonstrate to the Lessor its ability to perform its obligations, which include decommissioning.

4.7.2 List of Decommissioning Activities

In addition to any requirements under the Site Permit, each individual land lease requires proper decommissioning of turbines. Decommissioning of the site includes total removal of all turbines and related facilities at the termination of the Project Site Permit. Removal of related facilities shall include all access roads, equipment, towers, buildings, transformers, and cables or wires. Foundations will be removed to a depth of 1.2 m or four (4) feet below grade. Additionally, any disturbed surface shall be graded, reseeded, and restored as nearly as possible to its preconstruction condition.

5.0 ENVIRONMENTAL ANALYSIS

This section provides a description of the environmental conditions that exist within the Project. Consistent with MEQB procedures on siting LWECS and applicable portions of the Power Plant Siting Act, various exclusion and avoidance criteria were considered in the selection of the Project area. The proposed project area is approximately 22,400 acres. To support this siting process, maps of the area were generated that indicate the presence or absence of the following:

- National and state parks, wildlife refuges, wilderness areas, monuments, historic sites and districts, and special designation riverways and trails
- State wildlife management areas and scientific and natural areas
- Nature Conservancy preserves
- County and municipal parks
- Registered historic sites and districts
- Prime farmlands
- Wetlands
- Streams
- Residences

5.1 DESCRIPTION OF ENVIRONMENTAL SETTING (INTRODUCTION)

The Project is located in an area that is entirely rural with an agricultural-based economy. Corn and soybeans are the predominant crops in Jackson and Martin Counties. These counties are also top producers of livestock, especially hogs and pigs. The landscape in the Project area is relatively flat with gently rolling hills deposited as ground moraine by the Altamont Moraine Association of the Des Moines Lobe approximately 14,000 years ago. Elevations in the project area range from 1,390 and 1,240 feet above sea level.

5.2 DEMOGRAPHICS

5.2.1 DESCRIPTION OF RESOURCES

The Project is located within a lightly populated rural area in southwestern Minnesota. There is no indication of any new residential construction on the site. Information on demographics and housing for this section was taken from the 2000 U.S. Census.

The site is located in Jackson and Martin Counties, Minnesota. The population of Jackson County is 11,268, whereas the population of Martin County is 21,802. The Project is located in Cedar and Kimball townships. The per capita income in these townships are higher than their respective County averages. Cedar Township has approximately 1.2% of its population below poverty level, and Kimball Township has 5.7% of its population below poverty level. Table 5.1 summarizes the population and economic characteristics within the project area.

According to the 2000 U.S. Census, the largest industries employing residents of Martin and Jackson Counties are Services and Manufacturing.

Table 5.1
Population and Economic Characteristics

Location	Population	Per Capita Income	Percentage of Population Below Poverty Level
Jackson County	11,268	$17,499	8.6%
Kimball Township	142	$20,358	5.7%
Martin County	21,802	$18,529	10.5%
Cedar Township	248	$20,390	1.2%

5.2.2 IMPACTS

Short-term impacts to socioeconomic resources will be relatively minor. Approximately 40 acres of agricultural land will be permanently removed from production. Landowner compensation will be established by their lease, and the areas surrounding each turbine can still be farmed. Project construction will not cause additional impacts to leading industries within the Project area. There is no indication that any minority or low-income population is concentrated in any one area of the Project, or that the wind turbines will be placed in an area occupied primarily by any minority group.

If local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Jackson and Martin Counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in both counties and the state by circulation and recirculation of dollars paid out by the applicants as business expenditures and state and local taxes.

Expenditures made for equipment, energy, fuel, operating supplies and other products and services benefit businesses in the counties and the state.

Long-term beneficial impacts to the counties' tax base as a result of the construction and operation of the wind farm will contribute to improving the local economy in this area of Minnesota. The development of wind energy in this region has been important in diversifying and strengthening the economic base of southwestern Minnesota. Northwest Economic Associates prepared a report, "Assessing the Economic Development Impacts of Wind Power," that includes a case study of the Lake Benton I wind project in Lincoln County, Minnesota. In addition to the creation of jobs and personal income, the development generated $611,200 in county property taxes in 2000, thirteen percent of the property taxes collected in Lincoln County that year. The Project, as all LWECS installed after January 1, 2002, will pay a Wind Energy Production Tax to the counties of $0.0012 per kWh of electricity produced.

Continuing to establish this region of Minnesota as an important producer of alternative energy sources, such as wind, may spur the development of wind-related businesses in the area, in turn contributing to the economic growth in the region.

5.2.3 Mitigative Measures

Socioeconomic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during the project construction and an increase in the counties' tax bases from the construction and operation of the wind turbines.

In accordance with MEQB LWECS Site Permit requirements for previous projects, minimum setbacks for turbines from residences are 500 feet from occupied homesteads and 250 feet from roads.

5.3 NOISE

5.3.1 Description of Resources

Background noise levels in the project area are typical of those in rural settings, where existing nighttime noise levels are commonly in the low to mid-40 dBA. These are relatively low background levels and are generally representative of the site. Higher levels exist near roads and other areas of human activity. The windy conditions in this region tend to increase ambient noise levels compared to other rural areas.

For the noise evaluation, Trimont Wind I used representative sound power levels (L_p) of the GE 1.5 MW wind turbine that were provided by the manufacturer. To the extent that the sound characteristics of the selected turbine vary, Trimont Wind I will ensure compliance with MPCA noise standards and will submit an updated noise analysis to the MEQB following turbine selection.

5.3.2 IMPACTS

When in motion, the wind turbines emit a perceptible sound. The level of this noise varies with the speed of the turbine and the distance of the listener to the turbine. On relatively windy days, the turbines create more noise, however, the ambient or natural wind noise level tends to override the turbine noise as distance from the turbines increases.

The wind turbines will create sources of additional noise. Since the noise levels provided did not include any time-weighted average sound levels, the sound power level of 104.5 dBA was converted to a sound pressure level and compared to the Minnesota Daytime and Nighttime L_{10} and L_{50} Standards given in Minn. Rule 7030.0040. The turbines were modeled to determine at what distance turbine noise would not exceed Minnesota Pollution Control Agency (MPCA) noise standards. Turbines were modeled using the following equation for a hemispherical point source: $L_p = L_w - 10 \log (2*pi*r^2)-A_{atm}$ where L_p is defined as the sound pressure level at the distance of interest (r), L_w is the sound power level provided by the turbine manufacturer for a 1.5 MW turbine, and A_{atm} defined as the attenuation provided by atmospheric absorption. Sound is generated from the wind turbine at points near the hub or nacelle, eighty meters in the air, from the blade rotation, and motors near ground level. Therefore the noise source could be considered both spherical and hemispherical. Use of the sound propagation equation for a hemispherical point source is therefore conservative and predicts the maximum distance for noise exceedences.

The maximum distance calculated where an exceedence of a state noise standard would no longer occur is 190 meters (623 feet) for the Nighttime L_{50} standard of 50 dBA. Turbines will be sited according to the siting plan in section 1.1.3. Due to the possibility of cumulative noise levels being generated by the operation of multiple turbines, no turbines should be sited within 205 meters (672 feet) of an occupied residence in order to avoid exceeding the MPCA Nighttime L_{50} Standard (Minn. Rule 7030.0040).

5.3.3 MITIGATIVE MEASURES

Impacts to nearby residents and other potentially affected parties in terms of noise will be taken into consideration as part of the actual siting of the turbines.

5.4 VISUAL IMPACTS

5.4.1 DESCRIPTION OF RESOURCES

The topography of the Project area is relatively flat with gently rolling hills and elevations that range between 1,390 and 1,240 feet above sea level.

Agricultural fields, farmsteads, fallow fields, large open vistas, and gently rolling topography visually dominate the wind farm site. The landscape can be classified as rural open space. The photo in Figure 10 shows a typical landscape of an agricultural field within the Project Area.

Within the project area, corn and soybeans are the most widely grown crops. Alfalfa, small grains, and pasture are additional crops in the study area, creating a low uniform cover. In the swales, there is occasional riparian growth of native willows, cattails, sedges, and rushes. A mix of deciduous and coniferous trees planted for windbreaks typically surrounds farmsteads. Generally, these forested areas are isolated groves or windrows established by the landowner/farmers to prevent wind erosion and shelter dwellings. Typical tree species include box elder, bur oak, cottonwood, American elm, silver maple, poplar, and willow.

The settlements in the Project area are residences and farm buildings (inhabited and uninhabited) scattered along the rural county roads. These structures are focal points in the dominant open space character of the vicinity. A number of the farm structures date back to the late nineteenth or early twentieth centuries and are representative of that era of Minnesota farm architecture. The only non-residential or non-farm structures in the project area are a tavern located in Section 26 of Kimball Township, the Kimball Town Hall located in Section 15 of Kimball Township, a church located in Section 35 of Kimball Township, the Cedar Town Hall located in Section 17 of Cedar Township, a church located in Section 20 of Cedar Township, and GRE's Lakefield Junction Generating station located in Section 19 of Cedar Township.

5.4.2 IMPACTS

The placement of turbines will have an effect on the visual quality within the site vicinity. However, discussion of the aesthetic effect of the proposed wind farm is based on subjective human response. The wind farm would have a combination of effects on the visual quality/rural character of the area. From one measure of standards the proposed project could be perceived as a visual intrusion, characterized as metal structures, 80 meters (262 feet) high at hub height, intruding on the natural aesthetic value of the landscape.

On the other hand, wind farms have their own aesthetic quality, distinguishing them from other non-agricultural land uses. First, the Project will not generate much traffic or significantly increase day-to-day human activity in the area. Therefore, the Project site would retain the rural sense and remote characteristic of the vicinity. Second, although "industrial" in form and purpose, turbines are essentially "farming" the wind for energy. The proposed land use would not involve any ongoing industrial use of non-renewable resources or emissions into the environment. Although the turbines are high-tech in appearance, they are compatible with the rural, agricultural heritage of the area.

Essentially, the installation of the Project will alter the land use and visual quality of the area. The highest elevations are present in the southwest region of the Project area. The dominant landform at the Project area is ground moraine that was deposited by the Altamont Moraine Association of the Des Moines Lobe approximately 14,000 years ago. An elevation map of the Project area is shown in Figure 11.

Visual impacts will be most evident to people visiting the Laurs Lake Wildlife Management Area

(WMA), which is approximately two and one half miles west of the Project site; the Caron WMA, which is approximately four miles southeast of the site; and the Cedar-Hanson Park, located on the north side of Cedar Lake, approximately three miles east of the Project site. These impacts will diminish the natural quality of those areas and the experience of the persons utilizing those areas. While it may be true to some extent that the ability to see turbines in the background intrudes upon the purity of that experience, the same could be said of any human habitation or activity in the vicinity, and the presence of turbines may be less intrusive than many such activities. Nonetheless, this may be an impact, which is perceived to be negative.

5.4.3 MITIGATIVE MEASURES

The following are proposed mitigative measures:

- Turbines will not be located in biologically sensitive areas such as wetlands or relic prairies.
- Turbines will be illuminated to meet the minimum requirements of FAA regulations.
- Existing roads will be used for construction and maintenance where possible. Road construction will be minimized.
- Access roads created for the wind farm facility will be located on gentle grades to minimize visible cuts and fills.
- Temporarily disturbed areas will be reseeded to blend in with existing vegetation.

To attain maximum efficiency, wind power technology requires as much exposure to the wind as possible. Mitigation measures that would result in shorter towers or placement of the turbines at alternate locations off the ridgelines would result in less efficiency per unit.

5.5 PUBLIC SERVICES AND INFRASTRUCTURE

5.5.1 DESCRIPTION OF RESOURCES

The Project is located in a lightly populated, rural area in southwestern Minnesota. There is an established transportation and utility network that provides access and necessary services to the light industry, small cities, homesteads, and farms existing near the study area. The closest town to the project area is the City of Trimont. The City provides sanitary sewer, water, cable television, telephone, and library services. Additionally, the City's emergency services include a volunteer fire department and ambulance service and have two full-time police officers. Kimball and Cedar Townships have limited public infrastructure services, which is typical of most townships. Homes typically utilize septic systems and water wells for their household needs.

County and township roads that run coincident with section lines characterize the existing roadway infrastructure in and around the project area. There are four County State Aid Highways (CSAH) within the project area. In Jackson County, CSAH 29 is two miles east of the western edge of the project area and turns east toward Martin County, one mile north of CSAH 28, which is part of the southern boundary of the project area. CSAH 28 becomes CSAH 44 in Martin County. CSAH 7 in Martin County is the eastern border of the project area.

The existing traffic volumes on the area's county highways are documented in Table 5.2 and Figure 12. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day, or Average Daily Traffic (ADT). The highest existing ADT in or near the project area is below 300 vehicles per day.

Table 5.2
Existing Daily Traffic Levels

Roadway Intersection Description	Existing Average Daily Traffic (ADT)
Along Jackson CR 84 between CSAH 29 and County Line [1]	25
Along Jackson CR 84 between CSAH 21 and CSAH 29[1]	40
Along Jackson CSAH 30 between CSAH 21 and CSAH 29[1]	190
Along Jackson CSAH 29 between CSAH 36 and CSAH 28 [1]	270
Along Jackson CR 85 between CSAH 28 and CSAH 30 [1]	35
Along Jackson CR 85 between CSAH 29 and CSAH 36 [1]	50
Along Jackson CR 79 between CR 85 and CSAH 29[1]	20
Along Martin CR 150 between County Line and TH 4 [2]	120
Along Martin CR 103 between CSAH 44 and CSAH 21 [2]	45
Along Martin CSAH 44 between County Line and CSAH 9 [2]	260

1. Source: 2000 Traffic Volume General Highway Map, Jackson County, MN
2. Source: 2001 Traffic Volume General Highway Map, Martin County, MN

Trunk Highway (TH) access to the project area is served by TH 4, which runs generally north-south through the City of Trimont located approximately five miles to the east of the project area. In Minnesota, all trunk highways are contiguous, such that the entire trunk highway system can be accessed from any other trunk highway. TH 4 intersects I-90 approximately seven miles south of the City of Trimont, as well as TH 60 approximately 14 miles north of the City of Trimont.

There are currently three utility corridors running through the project area. Xcel Energy has a 345 kV transmission line running southwest to northeast. This transmission line crosses with Northern Border Natural Gas's natural gas pipeline near the Martin County Substation and the GRE Lakefield Generating

Station (Figure 2). In addition, a water pipeline currently enters the Lakefield Junction Generating Station that extends from Trimont.

5.5.2 IMPACTS

The Project is expected to have a minimal effect on the existing infrastructure. The following is a brief description of the impacts that may occur during the construction and operation of the project.

- Electrical Service. Construction of the project will add up to 67 wind turbine generators, a pad-mounted transformer at the base of each turbine, an underground electrical collection system, a project feeder system that will feed power to the point of interconnection, and a wind farm substation. At the wind farm substation, the electric voltage will be stepped up to transmission level voltage, which is expected to be 345 kV. The power will then be transmitted to Xcel Energy's Martin County Substation, adjacent to GRE's Lakefield Junction Generating Station, where it will enter the grid.
- Roads. Constructing the Project will require the addition of approximately 14 miles of gravel access roads. In addition, during operation of the project, the access roads will be used by operation and maintenance crews while inspecting and servicing the wind turbines. The access roads will be between towers, offset as necessary to allow for adequate crane access. One road will be required for each string. The roads will be approximately 4.9 meter (16 feet) wide and low profile to allow cross-travel by farm equipment. Trimont Wind I will work closely with the landowners to locate these access roads to minimize land-use disruptions to the extent possible. A map depicting the layout of the access roads is shown in Figure 3.
- Water Supply. Construction and operation of the Project will not significantly impact the water supply. The installation or abandonment of any wells is not required for the Project. However, in the event wells are abandoned, they will be capped as required by Minnesota law. The Project will not require appropriation of surface water or dewatering. It is likely that the Project will require a single domestic-sized well for the operations and maintenance facility. The rural water supply may alternately provide this water for the operations and maintenance facility.
- Natural Gas Pipeline. Construction and operation of the Project will not impact the natural gas pipeline.
- Telephone and Fiber Optic. Construction and operation of the Project will not impact the telephone and/or fiber optic service to the project area. Gopher One Call will be contacted prior to construction to locate and avoid underground facilities. To the extent Project facilities cross or otherwise affect existing telephone or fiber optic lines or equipment, Trimont Wind I will enter into agreements with service providers so as to avoid interference with their facilities.

- Radio Towers. There is one radio tower located approximately three miles east of the Project site, and one radio tower located approximately seven miles northeast of the Project site. Trimont Wind I will not operate the wind farm so as to cause microwave, television, radio, electronic, or navigation interference contrary to Federal Communications Commission (FCC) regulations or other law. In the event the wind farm or its operation causes such interference, Trimont Wind I will take the measures necessary to correct the problem.
- Radar. No radar towers are located in the vicinity of the Project. In any case, wind turbines are required to be constructed at a certain minimum distance from a radar facility, determined by the height of the wind turbine and tower, so that construction and operation of the project does not affect radar operation. Specific information on longitude, latitude, and elevation of the turbines will be submitted to the FAA.
- Television Reception: Residents in Jackson and Martin Counties receive television signals from Mankato (one channel), Jackson and Frost (nine channels), and Godahl, near St. James (10 channels). Residents in the community are anticipating digital television within the next few years. Trimont Wind I will not operate the Project so as to cause television interference contrary to FCC regulations or other law. In the event of a material problem after construction, Trimont Wind I will work with affected residents to determine the cause of interference and, where necessary, reestablish acceptable reception quality in a timely fashion.

5.5.3 MITIGATIVE MEASURES

Construction and operation of the proposed wind farm project will be in accordance with all associated federal and state permits and laws, as well as industry construction and operation standards. Due to the minor impacts expected on the existing infrastructure during Project construction and operation, extensive mitigation measures are not anticipated.

5.6 CULTURAL AND ARCHAEOLOGICAL IMPACTS

5.6.1 DESCRIPTION OF RESOURCES

The proposed Project area is within Anfinson's (1997) Prairie Lake archaeological region. Archaeologically, human occupation of the project area vicinity between glacial recession and the present could be roughly divided into four periods: the Early Prehistoric (ca. 12,000 years before present (BP) to 5,000 BP); the Middle Prehistoric (5,000 BP to 1,100 BP); the Late Prehistoric (1,100 BP to 350 BP); and the Historic (350 BP to present). Each period can be further discussed by traditions based on cultural material observed in archaeological contexts and, later, by oral and written accounts. A more global, period-based discussion based on Anfinson (1997) is appropriate here.

Post-glacial occupation of the project vicinity may have begun approximately 12,000 years ago. Archaeologically, this marked the beginning of the Early Prehistoric Period (ca. 12,000 BP to 5,000 BP), in which migratory groups of people hunted native herding animals, including bison, elk and deer and extinct megafauna such as mastodon. The principal means of subsistence included the exploitation of available small game and fish and plant resources. Although surface finds of fluted and lanceolate projectile points associated with Paleoindian Traditions have been identified in southern Minnesota including Faribault and Brown Counties, intact sites are rare. Early Prehistoric sites have been identified in upland areas and riverine terraces as well as the locations of archaic lakes.

The material culture record from the Middle Prehistoric Period (5,000 BP to 1,100 BP) illustrated changes in subsistence with the beginnings of agriculture and the emergence of permanent settlements. This diversification of culture and associated technologies reflects more highly regionalized adaptations to specific or local environmental conditions as the climate gradually shifted to a cooler, wetter trend. Dependence on game hunting continued, but a reliance on lacustrine environments developed as well in the Prairie Lake Region, as illustrated by material culture from the Mountain Lake Site, approximately 12 miles northwest of the Project area. More permanent habitation of areas, the beginning of mortuary practices, and the utilization of ceramics illustrate the important developments of the period. Fox Lake, a ceramic series that represents the first appearance of pottery vessels in the prairie regions of southern and southwestern Minnesota, was first identified on an Island in Fox Lake, approximately 16 miles south east of the Project area. Lake Benton is another ceramic series that is distributed throughout southwestern Minnesota and extends well into north-central Iowa. Lake Benton ceramics have been recovered from excavated sites in Jackson, Martin and Cottonwood Counties.

Middle Prehistoric traditions continued into the beginning of the Late Prehistoric Period (1,100 to 350 BP) years ago, in which several major trends are apparent, including the intensification of food production. This rapid intensification is related to the emergence of Plains Village (Great Oasis) cultures in southern Minnesota. Anfinson (1997) noted that such intensification was largely absent in the Project area and vicinity and limited to the Minnesota and Blue Earth river valleys; however, some Late Prehistoric traditions are represented at area archaeological sites, including Mountain Lake and Fox Lake.

Little is known regarding the transition between the Late Prehistoric traditions and early European exploration of the region. Prior to the westward displacement of Eastern Dakota groups (Mdewakanton, Wapeton, Sisseton, and Wahpekute) by the Ojibwe, the Yankton and Yanktonai (Nakota) and some Teton (Lakota) were likely the principal Dakota groups in the region. By the mid-1800s, the fur trade era had ended and the subsequent intensification of white settlement extensively depleted the animal population and severely displaced Native American communities (Anfinson 1987). Resettlement of Native Americans by the U.S. Government, beginning in the mid-1800s, resulted in several reservations of primarily Eastern Dakota groups in southern and western Minnesota.

Euroamericans settled the vicinity by the middle of the 19th century, primarily for agricultural pursuits. Jackson, Windom and Mountain Lake were established in the late 1850s as frontier farming communities. The westward expansion of railroads and farmers increased in intensity after 1870. By the turn-of-the-century, the railroads were complete, cities had been established, and the counties were growing.

The Minnesota State Historic Preservation Office (SHPO) records indicate that there are no archaeological sites located within the Project area and one prehistoric site in the wider study area (i.e. within one mile of the project area). Site 21MRq, a historically reported prehistoric archaeological site, has not been formally investigated.

Despite the absence of previously recorded prehistoric archaeological sites in the study area, there remains a moderate potential for prehistoric cultural resources. Known archaeological sites are in the vicinity, many of which were studied during other surveys and excavations particularly at Fox and Mountain Lakes. Prehistoric archaeological sites are especially concentrated near existing and former lacustrine environments; this concentration appears to be a function of relative large artifact density at these locations. Most of the study area is on upland terrain between Cedar Creek and the North Fork of Elm Creek, a type of geographic feature that may have attracted previous human activity particularly in the Early and Middle Prehistoric periods, particularly hunting and resource gathering activities. These site types are necessarily more ephemeral than regional lacustrine habitation sites but nevertheless may exist in these upland areas. Historic-period archaeological resources may also exist in the project area. Any such sites would likely be related to Euroamerican farming activities and associated residences. Although some historic-period material culture may be visible on the surface, such as farm implements, historic debris, and abandoned farm buildings, the historic map record for the Project area should be consulted in order to guide historical archaeological studies within the Project area. If turbine footprints, cable trenches, access roads, and borrow areas are proposed for construction in a historic-period occupation location represented in the archival literature, particular effort would be made to identify any historic-period archaeological component at that location. According to the Minnesota SHPO, there are ten inventoried structures within the project area and one additional inventoried structure within one mile of the Project area (Table 5.3). The National Register of Historic Places (NRHP) status of the structures has not been evaluated. Other standing structures are likely in the study area.

Currently, there are no known traditional cultural properties (TCPs) or Native American sacred sites within the study area.

5.6.2 IMPACTS

Cultural resources could be impacted directly during the construction and operation of a wind energy facility. Construction within the turbines' footprints, cable trenches, access roads, and borrow areas could impact cultural resources. In addition, construction of turbines may impact viewshed integrity from existing standing structures.

Due to the known and potential cultural resources in the study area and its vicinity, and the impacts of wind energy facilities on these resources, a cultural resources survey was recommended by the Minnesota SHPO (Appendix B, letter dated September 11, 2003). It is anticipated that a survey will be conducted in the summer prior to construction.

Table 5.3
Inventoried Historic Structures in the Trimont Wind Project Study Area

Inventory Number	Property Name	County	Location				Comments
			Townshi	Range	Section	¼ - ¼ - ¼	
JK-KIM-001	Kimball Town Hall	Jackson	104	34	15	SW-SW-SW	In project area
JK-KIM-002	Calvin Fett Farmhouse	Jackson	104	34	20	SE-SE-SE	In project area
JK-KIM-003	Calvin Fett Barn	Jackson	104	34	20	SE-SE-SE	In project area
JK-KIM-004	Calvin Fett Granary	Jackson	104	34	20	SE-SE-SE	In project area
JK-KIM-005	Calvin Fett Garage	Jackson	104	34	20	SE-SE-SE	In project area
JK-KIM-006	Calvin Fett Chicken Shed	Jackson	104	34	20	SE-SE-SE	In project area
JK-KIM-007	Loren Schoewe Farmstead	Jackson	104	34	26	SE-SW-SE	In project area

JK-KIM-010	Loren Schoewe Granary	Jackson	104	34	26	NE-NE-NE	In project area
JK-KIM-011	Immanuel Lutheran Church of Alpha	Jackson	104	34	35	NE-NE-NE	In project area
MR-CED-002	Church	Martin	104	33	20	NE-NE-NE	In project area
MR-CED-003	Bridge No. L-7230	Martin	104	33	31	SW-SW-SW	Within one mile of project area

5.6.3 MITIGATIVE MEASURES

A targeted cultural resources survey will be conducted to determine the presence or absence of previously unrecorded cultural resources in those areas that will be impacted by construction of wind turbines, cable trenches, access roads, and borrow areas. In addition, existing standing structures in the Project area will also be recorded along with previously inventoried structures. All cultural resources will be evaluated for integrity and eligibility for listing on the NRHP. Any cultural resources found to be potentially eligible for nomination to the NRHP will be avoided, if possible. All archaeological investigations will meet or exceed the U.S. Department of the Interior's Standards and Guidelines for Archaeology and Historic Preservation.

5.7 RECREATIONAL RESOURCES

5.7.1 DESCRIPTION OF RESOURCES

Recreational opportunities in Jackson and Martin County include: camping, hiking, biking, canoeing, swimming, hunting, and nature observation. Figure 13 depicts the locations of recreation and wildlife areas near the proposed Project site.

There are no State Wildlife Management Areas, State Parks, State Scientific and Natural Areas (SNA) or Nature Conservancy lands within the Project area, however; there are several of these areas that lie within four miles of the Project site.

There are two WMAs within four miles of the project site. The closest is the Laurs Lake WMA, which is approximately two and one half miles west of the Project site. The Caron WMA is approximately four miles southeast from the site. The closest State Park is the Kilen Woods State Park, which is located six miles west-southwest of the project site. There are two SNAs within six miles of the project site. The Des Moines Prairie SNA is located six miles directly west of the project site, whereas the Holthe Prairie SNA is located five and one half miles west-southwest of the Project site.

In Martin County, the Cedar-Hanson Park is located on the north side of Cedar Lake, approximately three miles east of the Project site. The park features water access, fishing, picnic facilities, camping, hiking, and swimming. The predominant fish in Cedar Lake are crappie (*Pomoxis spp.*), although northern pike (*Esox lucius*) and walleye (*Stizostedion vitreum*) are also present in good numbers. Cedar-Hanson Park is the largest county park in Martin County, and is approximately 80 acres.

Lakes within a four-mile radius of the site with public boat access are Fish Lake, Cedar Lake, Big Twin Lake, and Laurs Lake.

5.7.2 IMPACTS

Visual impacts will be most evident to recreationalists using the Laurs Lake and Caron WMAs, Cedar-Hanson Park, Cedar Lake, North Lake, Buffalo Lake, Watkins Lake, Big Twin Lake, Little Twin Lake, and Fish Lake within a four-mile radius of the site.

5.7.3 MITIGATIVE MEASURES

Wind turbines will not be located within County Parks, WMAs, SNAs or in Nature Conservancy Preserves, therefore no mitigative measures will be necessary.

5.8 PUBLIC HEALTH AND SAFETY

5.8.1 DESCRIPTION OF RESOURCES

Air Traffic

There are no airports located within the vicinity of the Project site. However, the vast majority of the current land use is agriculture, which may require periodic overhead spraying or crop dusting. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbine and met towers in active croplands and installation of overhead distribution lines will create a potential for collisions with crop-dusting aircraft. However, distribution lines are expected to be similar to those that are present already (located along the edges of fields and roadways) and the turbines and met towers themselves would be visible from a distance.

Electromagnetic Fields

Existing extremely low-frequency electric and magnetic fields (ELF-EMF) in the Project area occur where any electric conductor exists with an electrical current flowing through it.

Examples of such conditions include high-voltage transmission lines, distribution (feeder) lines, substation transformers, house wiring, and electrical appliances. Transmission lines are not fundamentally different from other electrical conductors. ELF-EMF can occur indoors and outdoors.

Since 1979 there has been considerable attention focused on understanding the effects of electric and magnetic fields (EMF) on humans. The question of whether exposure to power-frequency (60 Hz) magnetic fields can cause biological responses or even health effects has been the subject of considerable research for the past three decades. There is presently no Minnesota statute or rule that pertains to magnetic field exposure. The most recent and exhaustive reviews of the health effects from power-frequency fields conclude that the evidence of health risk is weak. The National Institute of Environmental Health Sciences (NIEHS) issued its final report, "NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields" on June 15, 1999, following six years of intensive research. NIEHS concluded that there is little scientific evidence correlating extra low frequency EMF exposures with health risk.

The Minnesota State Interagency Working Group on EMF Issues, consisting of members from the Minnesota Department of Health, Department of Commerce, Public Utilities Commission, Pollution Control Agency, and Environmental Quality Board conducted research related to EMF, which resulted in similar findings to the NIEHS report. The group issued "A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options" in September of 2002 wherein it concluded:

> Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, and some have shown a weak association. More recently laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer…
>
> The Minnesota Department of Health (MDH) concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of health risk from EMF cannot be dismissed.

The conclusions of the Minnesota State Interagency Working Group are also consistent with those reached by the Minnesota Department of Health in 2000 and the 1999 Final Report by the NIEHS.

Security

The Project site is located in an area that has a low population density. Construction and operation of the project will have minimal impacts on the security and safety of the local populace.

Traffic

The existing traffic levels for the U.S. trunk highways, county state aid highways, and county roads in the Project area are shown in Figure 12.

5.8.2 IMPACTS

Air Traffic

The Project will have no significant impacts on air traffic in the region because there are no airports in the vicinity and the wind and met towers will have lighting to comply with FAA requirements.

Electromagnetic Fields

While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate. Based on the most current research on electromagnetic fields, the Project will have no significant impact to public health and safety due to ELF-EMF. The addition of these transmission facilities is not expected to add significantly to the presence of ELF-EMF exposure in the vicinity.

Security

Project construction and operation will have no significant impact to security and safety of the local community.

Traffic

The maximum construction workforce is expected to generate approximately 25 additional vehicle trips per day. Using any combination of county highways and roads throughout the Project area, the traffic impacts are considered negligible. Since many of the area roadways have minimal ADT currently, the addition of 25 vehicle trips may be perceptible, but would still be less than seasonal variations such as autumn harvest.

Truck access to the Project area is generally served by TH 4 into the City of Trimont. From Trimont, CSAH 44 will serve as the primary truck access into the project area. Specific additional truck routes will be dictated by the location required for delivery. Additional operating permits will be issued by the Counties for over-sized truck movements.

5.8.3 MITIGATIVE MEASURES

Air Traffic

Trimont Wind I will light the turbines and met towers to comply with FAA requirements and USFWS guidelines.

Electromagnetic Fields

No impacts due to ELF-EMF are anticipated and no mitigation is necessary.

Security

The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The towers will be placed 250 feet from roads and 500 feet from occupied homesteads. These distances are considered to be safe based on developer experience, and are consistent with prior MEQB permits for LWECS. They also serve to minimize the danger of ice throws and reduces noise and shadow flicker.
- Security measures will be taken during the construction and operation of the project including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities.
- Turbines will sit on solid steel enclosed tubular towers in which all electrical equipment will be located, except for the pad-mounted transformer. Access to the tower is only through a solid steel door that will be locked when not in use.
- Where necessary or requested by landowners, Trimont Wind I will construct gates or fences.

Traffic

The traffic projections for construction will not significantly impact public health and safety because the local roads are designed to carry more than 25 additional trips per day.

5.9 HAZARDOUS MATERIALS

5.9.1 DESCRIPTION OF RESOURCES

Trimont Wind I is not aware of any significant hazardous waste sites within the Project area. The land is primarily rural and used for agriculture. Potential hazardous materials within the Project area would be associated with agricultural activities, and include petroleum products (fuel and lubricants), pesticides, and herbicides. Older farmsteads may also have lead-base paint, asbestos shingles, and Polychlorinated Biphenyls (PCB) in transformers. Trash and farm equipment dumps are common in rural settings.

There will be three types of fluids used in the operation of the wind turbines that are petroleum products. These fluids are necessary for the operation of each turbine and include:

- Gear box oil – synthetic or mineral depending on application
- Hydraulic fluid
- Gear grease

5.9.2 IMPACTS

Trimont Wind I will conduct a Phase I Environmental Site Assessment prior to construction to avoid hazardous waste sites.

All fluids will be contained within the wind turbine structure. There should be no leakage and no need to dispose of the fluids (except in the rare case of contamination) over the life of the wind turbine.

5.9.3 MITIGATIVE MEASURES

Because there are no proposed impacts to hazardous waste sites, no mitigative measures are necessary. If any wastes, fluids or pollutants are generated during any phase of the operation of the Project, they will be handled, processed, treated, stored and disposed of in accordance with Minnesota Rules Chapter 7045.

5.10 EFFECTS ON LAND-BASED ECONOMIES

5.10.1 AGRICULTURE/FARMING/FORESTRY/MINING

5.10.1.1 Description of Resources

Agriculture/Farming

The majority of the site is cultivated farmland, and minor amounts of grassland, as shown in the Land Use Map, Figure 14. There are also small areas of cultivated land that are currently enrolled in the Conservation Reserve Program (CRP). Cultivated land comprises approximately 21,240 acres of the Project area. Grasslands comprise 478 acres of the land. Approximately 97 percent of the land in the Project area is utilized for agricultural purposes. Corn and soybeans are the predominant crop in Jackson and Martin Counties. These counties are ranked within the top 10 producers of these crops in the state of Minnesota. Martin County is ranked as the second and third producer of corn and soybeans, respectively. These counties are also top producers of livestock, especially hogs and pigs. Martin County in particular is ranked first in the state in hog and pig production. These agricultural products are major sources of income in the study area. Converting cropland to CRP and Reinvest in Minnesota (RIM) programs is another source of farm income. CRP and RIM lands are cropland planted to conservation grasses and legumes to protect and improve the soil and cannot be harvested or pastured.

Within the Project area, corn and soybeans are the most widely grown crop. Alfalfa, small grains, and pasture are additional crops in the study area. According to the 1997 Census of Agriculture, the amount of land in farms increased two percent in Martin County, whereas in Jackson County it decreased four percent.

Most cultivated lands within the Project area have drain tile installed. These are often areas of former wetlands or surface water ponding that have been drained to create more land that is suitable for producing crops.

Forestry

Jackson and Martin Counties are in the region of Minnesota historically known for its prairie grasslands. Economically important forestry resources are not found in this region of Minnesota. Forested areas are primarily associated with homes in the form of woodlots and along the creeks within the Project site.

Mining

Mineral deposits in southwestern Minnesota consist of sand and gravel from unconsolidated surficial deposits, building stone from quartzite rock units, and scattered clay/shale deposits for brick making.

Sand and gravel resources occur in glacial till and outwash deposits. Many of the pits are inactive, abandoned or their use is limited to the landowner. Other than a few sand and gravel operations, there are no active industrial pits or quarries in the Project area.

Based on the soil survey and field surveys of the Project area, there are four inactive gravel pits located within the study area. They are found within the Project area and are at the following locations:

- Township 104 North, Range 33 West, Section 16 and 21
- Township 104 North, Range 34 West, Sections 22 and 34

5.10.2 IMPACTS

Agriculture/Farming

Impacts to this prime farmland will be determined once turbine and road placement have been finalized. Most of the soil within the Project area is considered prime farmland. The loss of agricultural land to the construction of the wind farm will reduce the amount of land that can be cultivated.

Prime farmland is the land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. The National Resource Conservation Service (NRCS) has two classifications for prime farmland. The first is where all areas of the soil series are classified prime farmland. The second is where only the drained areas of the soil series are prime farmland. The NRCS also identifies Farmland of statewide importance, which is land that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. Generally, additional farmlands of statewide importance include those that are nearly prime and that produce high yields of crops in an economic manner when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmland soils if conditions are favorable. Table 5.4 lists the soils considered Prime Farmland and soils of statewide importance within the Project site. Figure 15 shows the soil distribution in the Project area.

Turbine siting will include discussions with property owners to identify features on their property, including drain tile, which should be avoided. Impacts to drain tile due to project construction and operation are not anticipated. However, in the event that there is damage to drain tile as a result of construction activities or operation of the LWECS, the tile will be repaired according to the agreement between the Project Owner and the owner of any damaged tile

Table 5.4
Prime Farmlands Jackson and Martin Counties

Map Symbol	Soil Unit	All Areas Are Prime Farmland	Soil of Statewide Importance	Prime Farmland Only When Drained
102B	Clarion loam, 2-6% slopes[1]	X		
102B2	Clarion loam, 4-8% slopes, eroded		X	
112	Harps clay loam			X
113	Webster clay loam			X
114	Glencoe clay loam			X
118	Crippin clay loam	X		
130	Nicollet clay loam	X		
134	Okoboji silty clay loam			X
1833	Coland clay loam, occasionally flooded			X[2]
247	Linder loam		X	
255	Mayer loam			X
27B	Dickinson sandy loam, 1-6% slopes	X		
313	Spillville loam, occasionally flooded			X[3]
327B	Dickman sandy loam, 1-6% slopes		X	
336	Delft clay loam			X
35	Blue Earth, mucky silt loam		X	
350	Canisteo clay loam, depressional			X
39A	Wadena loam, 0-2% slopes	X		
392	Biscay sandy clay loam			X
41A	Estherville sandy loam, 0-2% slopes		X	
41B	Estherville sandy loam, 2-6% slopes		X	
539	Palms muck		X	
86	Canisteo clay loam			X
886	Nicollet-Crippin complex	X		
887B	Clarion-Swanlake loams, 2-6% slopes	X		
887C	Clarion-Swanlake loams, 6-12% slopes		X	
920B	Clarion-Estherville complex, 2-6% slopes		X	
920C2	Clarion-Estherville-Storden complex, 6-12%		X	
921B	Clarion-Storden loams, 2-6%	X		
921C2	Clarion-Storden loams, 6-12% slopes,		X	
94B	Terril loam, 2-6% slopes	X		
96	Collinwood silty clay	X		
956	Canisteo-Glencoe clay loams			X

[1] 1-6% slopes in Martin County

[2] Only areas which are drained and protected from flooding or those areas which are not frequently flooded are Prime.

[3] Only areas which are protected from flooding or those areas which are not frequently flooded are Prime.

Forestry

No impacts are anticipated to forestry resources. Since a majority of the woodlots are associated with homesteads, no impacts are anticipated to woodlots.

Mining

Significant impacts to sand and gravel mining are not anticipated. Sand and gravel operations tend to be small and other occurrences of these materials are likely to be present in nearby areas, including commercial operations in the general area.

5.10.3 MITIGATIVE MEASURES

Agriculture/Farming

The wind turbines and access roads will be located so that the most productive farmland (prime farmland) will be avoided as much as possible. Only land for the turbine and access roads will be taken out of crop production. Once the wind turbines are constructed, all land surrounding the turbines can still be farmed.

In the event that there is damage to drain tile as a result of construction activities or operation of the LWECS, Trimont Wind I will work with affected property owners to repair the damaged drain tile in accordance with the agreement between the Project Owner and the owner of any damaged tile.

Forestry

No impacts are anticipated; as such no mitigation will be necessary.

Mining

Towers will not be located within active or abandoned sand and gravel operations.

5.11 TOURISM AND COMMUNITY BENEFITS

5.11.1 DESCRIPTION OF RESOURCES

Traditionally, tourism in Jackson and Martin Counties focuses on promoting the area's recreational opportunities. However, wind development in southwest Minnesota is becoming a significant tourism attraction, bringing more visitors to the community.

5.11.2 IMPACTS

No impacts are anticipated to tourism resources. Positive impacts to the community may arise due to the presence of the Project. Communities such as Lake Benton have benefited not only from the financial benefits of the wind farms, but have also used them to educate the community about alternative energy resources and to promote tourism to the area.

5.11.3 Mitigative Measures

No impacts are anticipated, as such, no mitigation is necessary.

5.12 TOPOGRAPHY

5.12.1 Description of Resources

The topography of the Project area is relatively flat with gently rolling hills and elevations that range between 1,390 and 1,240 feet above sea level. The highest elevations are present in the southwest region of the Project area. The dominant landform at the Project area is ground moraine that was deposited by the Altamont Moraine Association of the Des Moines Lobe approximately 14,000 years ago. An elevation map of the Trimont Project area is shown in Figure 11.

There is a northwest-southeast trending surface water divide between Elm Creek and Cedar Run Creek basins. Much of the site consists of broad level areas and gently rolling hills with gentle side slopes that end in drainageways.

5.12.2 Impacts

No impacts to topography are anticipated. Wind turbines and access roads will not require significant excavation or fill.

5.12.3 Mitigative Measures

No impacts are anticipated, as such, no mitigative measures are necessary.

5.13 SOILS

5.13.1 Description of Resources

There are two main soils associations found within the Project area. The dominant association is Canisteo-Glencoe (Canisteo-Glencoe-Nicollet in Jackson County). Along Cedar Run and Elm Creeks, the Coland-Clarion-Delft (Clarion-Delft in Jackson County) association is present. A soil association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can make up another, but in a different pattern.

The Canisteo-Glencoe-Nicollet Association is mainly on broad, nearly level areas and includes circular or elongate depressions. The association generally consists of poorly drained, very poorly drained, and moderately drained loamy soil. The soil texture ranges from loam to clay loam. The soils formed in glacial till and loamy sediments on uplands. The surface soil is black and the subsoil is grayish brown.

The Coland-Clarion-Delft Association is present along floodplains, on the adjacent upland of streams and drainageways. The floodplain areas are occasionally to frequently flooded. Slopes range from 0 to 25 percent. The soil is black and texture ranges from loam to clay loam. The soils formed in glacial till plain.

The Project area is dominated by several soils. A description of each soil series is attached in Appendix C. The soil map in Figure 15 shows the distribution of soil associations and prime farmland.

5.13.2 IMPACTS

Construction of the wind turbines and access roads will increase the potential for soil erosion during construction and convert prime farmland from agricultural uses to industrial uses. The amount of land that will be converted to wind turbines, transformer pads, utility poles, and access roads will be determined once the site layout has been finalized. See Section 5.10.3 for a discussion of impacts to prime farmland.

5.13.3 MITIGATIVE MEASURES

A National Pollutant Discharge Elimination System (NPDES) permit application to discharge storm water from construction activities will be acquired by Trimont Wind I from the MPCA. Best Management Practices (BMP) will be used during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored material. In addition, the placement of wind turbines and access roads will be planned so that the conversion of prime farmland will be minimal.

5.14 GEOLOGIC AND GROUNDWATER RESOURCES

5.14.1 GENERAL DESCRIPTION OF RESOURCES

Glacial sediments deposited during the Pleistocene Epoch cover Jackson and Martin Counties. The surficial geology in the vicinity of the project area is ground and stagnation moraine deposited by the Altamont Moraine Association of the Des Moines Lobe approximately 14,000 year before present. The surficial deposits are glacial till that is very poorly sorted sediments deposited by glacial ice. The Des Moines Lobe till is calcareous, shale-rich and composed of unsorted clay, silt, sand, gravel, cobbles and boulders. Thick lenses of sand and gravel are commonly found intermixed in the clay through out the unit. The glacial material is approximately 200 to 300 feet thick in the Project area and the topography is relatively flat. A glacial tunnel valley is located east of the project area and is a topographic trough occupied by a chain of lakes (Buffalo, North, Cedar, Little Twin, and Big Twin Lakes). Glacial outwash deposits of sand and gravel are associated with the tunnel valley.

The uppermost bedrock unit in the project area is Precambrian quartzite and granitic crystalline rocks. Cambrian, Ordovician, and Cretaceous sedimentary bedrock deposits are present approximately 16 miles east of the project area, but were not deposited or eroded away at the Project area prior to deposition of the glacial sediments. Localized areas of bedrock highs can be found in the Project area.

Geologic-related mineral resources in the Project area include minor sand and gravel deposits. Gravel pits were formerly operated in Sections 16 and 21 in Martin County, adjacent to Cedar Run Creek, and sections 22 and 34 in Jackson County.

Groundwater resources in the vicinity of the Project area are generally derived from buried glacial outwash deposits of sand and gravel. Nearby Trimont municipal water supplies are obtained from a buried gravel outwash aquifer 125 feet below ground surface (bgs), pumping at an average rate of 400 gallons per minute (gpm). In the area, glacial sand and gravel aquifers are most accessible and widely used. Domestic water supplies are obtained from similar, but mainly discontinuous buried glacial sand and gravel aquifers. The County Well Index was reviewed for the Project area and fifteen domestic wells completed in the sand and gravel outwash lenses were identified. The wells were completed at depths ranging from 117-feet to 320-feet bgs. Residents indicate that roughly half of area homes obtain water for domestic use from wells and the other half is on rural water. Based on the age of many of the homesteads, the far majority of the existing wells at the site are probably not recorded in the County Well Index. This may indicate more domestic wells in the area than what is documented. Domestic groundwater supply appears to be fairly accessible in the Project area and is dependant on the relative occurrences of sand and gravel aquifers at any given area. Groundwater may occur at shallow depths locally.

5.14.2 IMPACTS

Impacts to geologic and groundwater resources are not anticipated. Water supply needs will be quite limited. It is probable that operations and maintenance water requirements will be satisfied with a single domestic-sized water well.

5.14.3 MITIGATIVE MEASURES

Wind turbine locations will not impact the use of existing water wells because the turbines will not be sited within 500 feet of occupied structures.

5.15 SURFACE WATER AND FLOODPLAIN RESOURCES

5.15.1 DESCRIPTION OF RESOURCES.

Surface water and floodplain resources for the study area were identified by reviewing U.S. Geological Survey topographic maps, Flood Insurance Rate Maps (FIRM) produced by the Federal Emergency Management Agency (FEMA), and Minnesota Public Waters and Wetlands Inventory (PWI) map. The major surface waters located within the study area include North Fork of Elm Creek, Elm Creek, and

Cedar Run Creek.

The Minnesota Department of Natural Resources (DNR) PWI map identifies four Public Waters within the Project site. Table 5.5 identifies the location of these Minnesota DNR Public Waters. Also within the Project area are a number of unnamed intermittent streams that are designated waters of the U.S. Figure 16 shows the locations of surface waters and Minnesota DNR Public Waters within the site.

Table 5.5
Minnesota DNR Public Waters

Public Water	Township	Range	Section(s)
North Fork of Elm Creek	104	34	8, 15, 16, 17, 22, 23, 26
Elm Creek	104	34	25, 26, 27, 28, 35, 36
Cedar Run Creek	104	33	5, 6, 8, 9, 16, 21
Unnamed Wetland (4W)	104	34	15

Review of the FEMA Floodplain maps (Figure 17) indicates that there is a 100-year floodway along the North Fork of Elm Creek, Elm Creek, and Cedar Run Creek.

5.15.2 Impacts

Construction of the wind turbines, transformer pads, and access roads will disturb land within the Project site. The wind turbines will be built on uplands, and this will avoid streams located in the lower positions in the landscape. Access roads to the turbines will be built to avoid impacts to surface waters.

5.15.3 Mitigative Measures

If the project will impact waters of the U.S. or Minnesota Public Waters, Trimont Wind I will apply for the necessary permits prior to construction. Access roads constructed adjacent to streams and drainageways will be designed in a manner so runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. A NPDES permit application and Storm Water Pollution Prevention Plan (SWPPP), will be prepared by Trimont Wind I and submitted to the MPCA prior to the construction of the wind turbines and access roads.

5.16 WETLANDS

5.16.1 Description of Resources

Wetlands near the Project area were identified by reviewing National Wetland Inventory (NWI) Maps and Minnesota PWI Maps. The site was field inspected on October 21, 2003. The wetlands are primarily associated with depressional features adjacent to the North Fork of Elm Creek, Elm Creek, Cedar Run Creek, and unnamed intermittent streams. There are also wetlands associated with former gravel pit areas in Sections 16 and 21 adjacent to Cedar Run Creek.

The site has been tiled and drained for agriculture, so there are not too many wetlands remaining in the hydric soil areas. There is a single Public Waters Wetland (4W) identified within the project site located in Section 15, Township 104 North, Range 34 West. The NWI wetland types and their acreage are presented in Table 5.6.

Table 5.6
NWI Wetland Types and Acreages

Classification System	**Wetland Acreages (by type)**					
Circular 39	Type 1	Type 3	Type 4	Type 5	Type 6	Type 7
Cowardin Classification	PEMA	PEMC, PEMF	PUBF	PUBG	PSSA, PSSC	PFO1A, PFO1C
Acres[1]	5.0	112.3	31.5	3.3	4.3	19.1

[1] Wetland acreage is calculated using USFWS NWI data.

The wetlands within the site are entirely palustrine systems. The major wetlands within the Project area are in Jackson County along Elm Creek and the North Fork of Elm Creek. See the NWI Map in Figure 18 for locations of wetlands.

5.16.2 Impacts

Wind turbines will be built on upland areas and this will avoid wetlands on the lower positions in the landscape. Access roads and supporting facility features will be designed to minimize impacts on the wetlands.

5.16.3 Mitigative Measures

Wetlands will be avoided during the construction phase of the Project. If wetland impacts cannot be avoided, Trimont Wind I will submit Section 404 and Minnesota Wetland Conservation Act permit applications to the U.S. Army Corps of Engineers and the State prior to construction.

5.17 VEGETATION

5.17.1 DESCRIPTION OF RESOURCES

The Project is in the tallgrass prairie biome in Minnesota. The map of the natural vegetation of Minnesota (Coffin and Pfannmuller, 1988) identifies the areas of Jackson and Martin Counties as upland prairie and prairie wetland, with a small amount of oak woodland and brushland in Jackson County. The upland prairie vegetation includes bluestems, Indian grass, needle grass, grama grasses, composites, and other forbs. The prairie wetland vegetation includes blue-joint grass, cord grass, cattails, rushes, and sedges.

As a result of settlement in the mid-1800s, the area was converted into farmland. During this process, the wetland areas were frequently ditched and drained. Only a small fraction of the original prairie and wetlands remain as relic habitats. With the settlement of the area, periodic burning of the land halted since settlers did not want to endanger their property (homes, crops, livestock, etc.). Tallgrass prairie developed with periodic fires that were either started by natural causes (i.e., lightning) or by Native Americans. Fires caused by natural means were controlled and human fire starting was prevented. Trees now had an opportunity to establish in the area. Trees were planted by landowners for wind blocks (windrows and homestead groves) or were established by natural means, such as being transported to the area by animals, birds or winds.

There may be a few small tracts of native prairie located on private lands in the study area. Several landowners are currently making an effort to restore native prairie species within and around the Project area.

Based on a review of aerial photographs, land use database information, and a visit to the Project site, HDR determined that the majority of the land area at the site is cultivated. Table 5.7 identifies current land use in the project area. The pasture grassland and wetland areas at the site may contain potential remnant native prairie areas. Native prairie is identified as lands that have never been plowed, with less than 10 percent tree cover, and presence of native prairie vegetation. Unplowed fields of native grassland or pasture, with 10 or more prairie plant indicator species, are considered to be prairie for the purposes of this site permit.

Table 5.7
Major Habitats and their Relative Abundance in the Project Area

Habitat	Acreage	Percent of Project Area
Farmsteads	249	1.1%
Cultivated Land	21,240	94.8%
Grassland	478	2.1%
Forest/Wooded	257	1.1%
Native Prairie	to be determined[1]	to be determined[1]
Wetlands	176[2]	0.8%[2]

[1] Exact acreage of native prairie will be determined by a field survey prior to construction.
[2] Actual wetland acreage will be determined by the wetland delineation conducted prior to construction.

Crops are primarily corn and soybean. Range and pasture lands are used to graze cattle, hogs, sheep, and horses. Heavily grazed range/pasture lands contain Kentucky bluegrass, quack grass, and brome grasses. Lightly grazed or undisturbed rangeland may contain native grass species including big blue stem, needle grass, and grama grass. CRP land is typically covered by brome grasses, orchard grass, and alfalfa. CRP may also be planted in native grasses such as big bluestem, little bluestem, and Indian grass. Land is typically put into CRP for ten-year cycles. Additional information on agriculture and farming can be found in Section 5.10.

Approximately 257 acres of the site is forested. Generally, these forested areas are isolated groves or windrows established by the landowner/farmers to prevent wind erosion and shelter dwellings. Typical tree species include box elder, bur oak, cottonwood, American elm, silver maple, poplar, and willow.

5.17.2 IMPACTS

The amount of vegetation that will be removed as a result of the proposed project will be determined once a permanent site layout is determined. It is anticipated that 40 acres of the project area will be used for turbines, access roads, O&M building, and substation. The vegetation will be permanently removed and replaced by access roads, wind turbines, or transformers to support the proposed design for the Project. During the construction of the wind power facilities, additional area may be temporarily disturbed for contractor staging areas and underground power lines. Wind turbines require an uninterrupted airflow. The turbines will be constructed at a certain distance from forests and groves to maximize turbine output and reduce tree removal. Construction will not impact farmsteads. Avoidance and minimization of impacts to wetlands and native prairies will reduce impacts to those vegetated areas.

5.17.3 MITIGATIVE MEASURES

The following measures will be used to avoid potential impacts to the vegetation of the area during selection of the Project and its subsequent development and operation:

- Conduct a pre-construction inventory of existing wildlife management areas, scientific and natural areas, recreation areas, wetlands, native prairie, and forests.
- Exclude established wildlife management, recreation and scientific and natural areas from consideration for wind turbine, access road, or electrical line placement.
- Avoid disturbance of wetlands during construction and operation of the Project.
- Minimize impacts to existing trees and shrubs.
- Use BMPs during construction and operation of the project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored material, revegetating non-cropland and range areas with wildlife conservation species and, wherever feasible, planting native tall grass prairie species in cooperation with landowners.
- Trimont Wind I shall, with the advice of the DNR, and any others selected by Trimont Wind I, prepare a prairie protection and management plan and submit it to the MEQB after issuance of the site permit and prior to construction. The plan shall address steps to be taken to identify native prairie within the project area, measures to avoid impacts to native prairie, and measures to minimize and mitigate for impacts if unavoidable. Wind turbines and all associated facilities, including foundations, access roads, underground cable, and transformers, shall not be placed in native prairie unless addressed in the prairie management plan. Measures to be taken to mitigate unavoidable impacts to native prairie will be agreed to by Trimont Wind I and DNR. Such measures may include restoration or management of other native prairie areas that are in degraded condition, conveyance of conservation easements, or other means agreed to by Trimont Wind I and DNR.

Native prairie is identified as lands that have never been plowed, with less than 10 percent tree cover, and presence of native prairie vegetation. Unplowed fields of native grassland or pasture, with 10 or more prairie plant species, are considered to be prairie for the purposes of this site permit. It is important that the entire site be inventoried, not just the tower or road locations in order to determine if a site is native prairie. A list of prairie indicator species can be found in Appendix 3 and Supplement to Appendix 3 in Minnesota's Native Vegetation: A Key to Natural Communities, Minnesota Department of Natural Resources Natural Heritage Program, 1993.

5.18 WILDLIFE

Information on the existing wildlife in the proposed wind farm area was obtained from a variety of sources including DNR and USFWS. In addition, extensive avian and bat monitoring studies have been conducted on Buffalo Ridge in Minnesota, which is located approximately 70 miles west of the Project. The habitat at Trimont Wind Project is similar to Buffalo Ridge, except there is more row crop agriculture and less pasture grassland throughout the Project area.

The following sections do not include any discussions on wildlife species considered by the state to be threatened or endangered or of special concern. Refer to Section 5.19 for information on these resources.

5.18.1 DESCRIPTION OF RESOURCES

Wildlife in the Project area consists of birds, mammals, fish, reptiles, amphibians, and insects, both resident and migratory, which utilize the Project area habitat for forage, breeding and/or shelter. The vegetation in the Project area is primarily agricultural row crops with adjacent roadside ditches. Trees include windbreaks and shelterbelts. Species present in the Project vicinity are associated with agricultural fields, pasture grasslands, and minor wetland and forested areas. Following is a discussion of migratory and resident birds, mammals, reptiles, and amphibians, and insects that are expected to exist in the Project area.

Birds

Various migratory and resident bird species utilize the Project site as a part of their life cycle. Migratory bird species are those that may use the Project site for resting, foraging or breeding activities for only a portion of the year. Resident bird species occupy the proposed wind farm site throughout the year.

The site vicinity is not a major waterfowl staging area or migration route. State survey data for the Jackson and Martin Counties indicate breeding populations of Canada geese, mallards, blue-winged teal, and wood ducks. Songbirds usually migrate at high altitudes through southern Minnesota. Common songbirds in the area include western meadowlark, song sparrow, American robin, red-winged blackbird, and killdeer. Upland gamebirds in the region include ring-necked pheasant and gray partridge. Common raptors in the area include red-tailed hawk, American kestrel, northern harrier, and Swainson's hawk.

Mammals

The mammal population in the area includes white-tailed deer, rabbit, red fox, badger, skunk, squirrel and other related rodents. These species use the food and cover available from agricultural fields, grasslands, farm woodlots, wetland areas, and wooded areas. Grassland areas and woody vegetation are also habitat for a variety of small mammals including house and deer mice, least and long-tailed weasels, and prairie and meadow voles.

White-tailed deer, an economically important species, have a strong affinity for agricultural crops and use farm woodlots, wooded ravines, and intermittent stream bottoms for shelter. Winter deer yards are common in larger wooded areas and abandoned homestead woodlots.

The avian studies on Buffalo Ridge also collected data on bats. Bat species present in southwestern Minnesota include the hoary bat, eastern red bat, big brown bat, silver-haired bat, and little brown bat.

Reptiles and Amphibians

Reptile and amphibian species, which may be present in the Project vicinity include the western plains garter snake, red-sided garter snake, western hognose snake, snapping turtle, western painted turtle, American toad, northern leopard frog, and western chorus frog.

Insects

While many insect species are important to the indigenous vegetation and wildlife, honeybees are the only species economically important in the Project area. There are two licensed apiaries located within the Project area in Sections 14 and 36 of Kimball Township, Jackson County.

5.18.2 IMPACTS

Development of the wind farm, including the construction and operation of the Project, is expected to produce a minimal impact to the wildlife. Based on studies of existing wind power projects in the United States and Europe, the impact to wildlife would primarily occur to avian and bat species. Extensive studies on the impacts of wind turbines to avian populations have been conducted on Buffalo Ridge in Minnesota. The final report on avian monitoring studies at Buffalo Ridge identified the following impacts:

- Following construction of the wind turbines there is a reduction in use of the area within 100 meters of the turbines by seven of 22 species of grassland breeding birds. It was hypothesized that lower avian use may be associated with avoidance of turbine noise, maintenance activities, and less available habitat. The researchers stated "on a large scale basis, reduced use by birds associated with wind power development appears to be relatively minor and would not likely have any population consequences on a regional level."
- Avian mortality appears to be low on Buffalo Ridge, compared to other wind facilities in the United States, and is primarily related to nocturnal migrants. Resident bird mortality is very low and involves common species. The researchers stated that "based on the estimated number of birds that migrate through Buffalo Ridge each year, the number of wind plant related avian fatalities at Buffalo Ridge is likely inconsequential from a population standpoint."

WEST, Inc. has prepared the following reports “Bat Interactions with Wind Turbines at Buffalo Ridge, Minnesota Wind Resource Area” and “Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting, and Mortality Information from Proposed Wind Developments” which provide information on potential impacts of wind facilities to bats. WEST found that bat collision mortality at foraging and roosting areas during the breeding season is virtually non-existent, despite documentation of use in close proximity to wind turbines. The data suggests that wind turbines do not currently impact resident breeding populations. Most bat mortality at wind facilities in the United States is associated with migrant or dispersing bats in the fall, possibly due to flying without echolocation. The observed bat mortality is not sufficient to cause population decline.

The impact of the proposed Project on wildlife is expected to be minimal. The only measurable impacts may be a small reduction in the available habitat that some of the wildlife uses for forage or cover. Operation of the wind farm will not change the existing land use.

5.18.3 Mitigative Measures

The following measures will be used to help avoid potential impacts to wildlife in the Project area during selection of the turbine locations and subsequent development and operation:

- Conduct a pre-construction inventory of existing biological resources, native prairie, and wetlands in the Project area.
- Exclude established wildlife management, recreation, and scientific and natural areas from consideration for wind turbine, access road, or feeder/collector line placement.
- Avoid disturbance of individual wetlands or drainage systems during construction of the Project.
- Avoid placement of turbines in native prairie tracts.
- Protect existing trees and shrubs that are important to the wildlife present in the area.
- Avoid construction activities within deer-wintering yards during winter.
- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored material.
- Revegetate non-cropland and pasture areas with wildlife conservation species.

5.19 RARE AND UNIQUE NATURAL RESOURCES

5.19.1 DESCRIPTION OF RESOURCES

The Endangered Species Act of 1973, as amended, requires that consultation pursuant to Section 7 be conducted to insure that a proposed Project will not affect the continued existence of any endangered or threatened species or adversely affect their habitats, and that corrective action be taken if adverse impacts may occur. The DNR maintains a Natural Heritage Database (NHD) through their Natural Heritage Program and Nongame Game Wildlife Program, which is the most complete source of data on Minnesota's rare, endangered, or otherwise significant plant and animal species, plant communities, and other natural features. The USFWS and the DNR were contacted to review the proposed Project for potential effects to threatened and endangered (T&E) species.

The DNR reviewed the NHD for rare plant or animal species or other significant natural features within approximately one-mile of the Project area, and did not identify any known occurrences. The DNR would like the Project area surveyed for native prairie since Jackson and Martin Counties are located within the Tallgrass Prairie biome of the state. In addition, the DNR requested an assessment of avian and bat use of the project site to determine the potential for avian and bat mortality due to the project (Appendix B).

The USFWS has reviewed the Project area and determined that "there are no federally-listed threatened or endangered species or critical habitat."

5.19.2 IMPACTS

No impacts to Rare and Unique Resources are anticipated.

5.19.3 MITIGATIVE MEASURES

Mitigative measures will not be necessary, since no impacts are anticipated to Rare and Unique Resources. A pre-construction inventory of existing biological resources, native prairie, and wetlands will be conducted in the Project area.

5.20 SUMMARY OF IMPACTS

5.20.1 Visual Impacts

The wind turbine arrays will be prominent features in the landscape. By design, these structures are placed in open areas of higher elevations. Some mitigative measures, as described in Section 5.4, can be implemented to somewhat limit visual impacts. However, there is no way to make these structures unnoticeable. The degree to which the visual impacts are considered adverse is subjective, and can be expected to vary depending, for example, on how often the viewer sees the turbines.

5.20.2 Commitment of Land

The Project site includes a total of 22,400 acres of land. Of the 22,400 acres, less than one percent of the land (approximately 40 acres) will be converted from natural vegetation or agricultural field to wind turbines, access roads, transformer pads and O&M facility. Approximately 14 miles of 16-foot wide gravel access road are anticipated for the site. However, existing land use can continue on the remainder of the land.

5.20.3 Noise

When in motion, the wind turbines emit a perceptible sound. The level of this noise varies with the speed of the turbine and the distance of the listener to the turbine. On relatively windy days, the turbines create more noise, however, the ambient or natural, noise level simply from the wind tends to override the turbine noise as distance from the turbines increases.

5.20.4 Wildlife

Birds and bats occasionally collide with wind turbines. The mortality associated with these collisions has been identified as inconsequential from a population standpoint. In addition, turbines may result in reduced use of habitat by grassland bird species within 100 meters of the turbine.

The impact of the proposed Project on wildlife is expected to be minimal. Approximately 40 acres of land will be converted for the access roads, turbine pads, maintenance facility, and substation. This will reduce available habitat that some of the wildlife uses for nesting, forage or cover.

5.20.5 DRAIN TILE

The Project site includes areas that are drained by drain tile to create more land that is suitable for producing crops. The impact of the proposed Project on the existing drainage systems of property owners is expected to be minimal. Turbine siting will include discussions with property owners to identify potential areas of drain tile. These locations will be avoided during construction of turbine locations. The lease agreement between Trimont Wind I and the property owner includes provisions for repair of damaged drain tile.

6.0 IDENTIFICATION OF REQUIRED PERMITS/APPROVALS

The federal and state permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 6.1.

Table 6.1
Potential Permits and Approvals Required for
Construction and Operation of the Proposed Facility

Agency	Type of Approval
Federal Aviation Administration	Notice of Proposed Construction or Alteration within 6 miles of Public Aviation Facility and structures over 200 feet to complete a 7460 Proposed Construction or Alteration Form
U.S. Army Corps of Engineers	Section 404 Permit
State of Minnesota	
Minnesota Board of Water and Soil Resources	Wetland Conservation Act Approval
Minnesota Environmental Quality Board	Site Permit
Minnesota Department of Natural Resources	Pubic Water Works
	License to Cross Public Lands and Waters
Minnesota Pollution Control Agency	NPDES Permit: Construction
	License for Very Small-Quantity Generator of Hazardous Waste
Minnesota Department of Health	Water Well Permit
	Plumbing Plan Review
Minnesota Public Utilities Commission	Certificate of Need
Local Permits	
Jackson County	Building Permits
	Individual Septic Tank Systems (ISTS) Permit
	Driveway Permit
	Utility Permit
	Moving Permit
Martin County	Building Permits
	Individual Septic Tank Permit
	Driveway Permit
	Utility Permit
	Overwidth/Overweight Permit
Townships	Road Access Permits

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